

线性代数

第一讲：行列式及其性质

习 题) 答

数学 数学与统计学



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习题1.1($P_{30} - P_{32}$)

1.)



习题1.1($P_{30} - P_{32}$)

1.)

$$\text{tr} A = a_{11} + a_{22} + \cdots + a_{nn};$$



习题1.1($P_{30} - P_{32}$)

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$$\text{tr}A = a_{11} + a_{22} + \cdots + a_{nn}; \text{tr}B = b_{11} + b_{22} + \cdots + b_{nn},$$



习题1.1($P_{30} - P_{32}$)

1.)

$$\text{tr}A = a_{11} + a_{22} + \cdots + a_{nn}; \text{tr}B = b_{11} + b_{22} + \cdots + b_{nn},$$

以

$$\text{tr}A + \text{tr}B =$$



习题1.1($P_{30} - P_{32}$)

1.)

$$\text{tr}A = a_{11} + a_{22} + \cdots + a_{nn}; \text{tr}B = b_{11} + b_{22} + \cdots + b_{nn},$$

以

$$\begin{aligned} \text{tr}A + \text{tr}B &= (a_{11} + a_{22} + \cdots + a_{nn}) + (b_{11} + b_{22} + \cdots + b_{nn}) \\ &= \end{aligned}$$



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习题1.1($P_{30} - P_{32}$)

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$$\text{tr}A = a_{11} + a_{22} + \cdots + a_{nn}; \text{tr}B = b_{11} + b_{22} + \cdots + b_{nn},$$

以

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2.) 比对图中各位置对应的像 值, 可得图1.1的像 Y 阵为



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2.) 比对图中各位置对应的像 值, 可得图1.1的像 Y 阵为

$$\begin{array}{cccccc} 0 & & & & & \\ & 0 & 64 & 128 & 64 & 0 \\ & \text{⋮} & & & & \\ & @ & & & & \end{array}$$



习题1.1($P_{30} - P_{32}$)

1.)

$$trA = a_{11} + a_{22} + \cdots + a_{nn}; \quad trB = b_{11} + b_{22} + \cdots + b_{nn},$$

以

$$\begin{aligned} trA + trB &= (a_{11} + a_{22} + \cdots + a_{nn}) + (b_{11} + b_{22} + \cdots + b_{nn}) \\ &= (a_{11} + b_{11}) + (a_{22} + b_{22}) + \cdots + (a_{nn} + b_{nn}) \\ &= tr(A + B): \end{aligned}$$

2.) 比对图中各位置对应的像 值, 可得图1.1的像 $\hat{Y}$ 阵为

0

0 64 128 64 0

B

64 128 192 128 64

B

B

DOC

@



习题1.1($P_{30} - P_{32}$)

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$$\begin{aligned} \text{tr}A + \text{tr}B &= (a_{11} + a_{22} + \cdots + a_{nn}) + (b_{11} + b_{22} + \cdots + b_{nn}) \\ &= (a_{11} + b_{11}) + (a_{22} + b_{22}) + \cdots + (a_{nn} + b_{nn}) \\ &= \text{tr}(A + B): \end{aligned}$$

2.) 比对图中各位置对应的像 值, 可得图1.1的像 Y 阵为

$$\begin{array}{ccccc} 0 & & & & \\ \text{0} & 0 & 64 & 128 & 64 & 0 \\ \text{0} & 64 & 128 & 192 & 128 & 64 \\ \text{0} & 128 & 192 & 255 & 192 & 128 \\ \text{0} & & & & & \end{array}$$



1.)

$$trA = a_{11} + a_{22} + \cdots + a_{nn}; trB = b_{11} + b_{22} + \cdots + b_{nn},$$

以

$$\begin{aligned} trA + trB &= (a_{11} + a_{22} + \cdots + a_{nn}) + (b_{11} + b_{22} + \cdots + b_{nn}) \\ &= (a_{11} + b_{11}) + (a_{22} + b_{22}) + \cdots + (a_{nn} + b_{nn}) \\ &= tr(A + B): \end{aligned}$$

2.) 比对图中各位置对应的像 值, 可得图1.1的像 $\hat{Y}$ 阵为

0	0	64	128	64	0
mmmm	64	128	192	128	64
mmmm	128	192	255	192	128
@mmmm	64	128	192	128	64



习题1.1($P_{30} - P_{32}$)

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$$\begin{array}{ccccc} 0 & & & & 1 \\ & 0 & 64 & 128 & 64 & 0 \\ \text{C} & 64 & 128 & 192 & 128 & 64 & \text{C} \\ \text{C} & 128 & 192 & 255 & 192 & 128 & \text{C} \\ \text{C} & 64 & 128 & 192 & 128 & 64 & \text{C} \\ \text{C} & & & & & & \text{C} \\ & 0 & 64 & 128 & 64 & 0 \end{array} :$$



习题1.1($P_{30} - P_{32}$)

3.)



习题1.1($P_{30} - P_{32}$)

3.) 比图1.2, 其对应的关系阵为

$$G_1 = \begin{pmatrix} 0 & 2 & 1 & 1 & 1 & 0 \\ 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \end{pmatrix}$$



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$$G_1 = \begin{pmatrix} 0 & 2 & 1 & 1 & 1 & 0 \\ 0 & 1 & 1 & 0 & 0 & 0 \end{pmatrix}$$



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3.) 比图1.2, 其对应的关系阵为

$$G_1 = \begin{pmatrix} 0 & 2 & 1 & 1 & 1 & 0 \\ 0 & 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 1 & 0 \end{pmatrix}$$



习题1.1($P_{30} - P_{32}$)

3.) 比图1.2, 其对应的关系阵为

$$G_1 = \begin{pmatrix} 0 & 1 & 0 & 0 & 0 \\ 2 & 1 & 1 & 1 & 0 \\ 0 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix} \begin{matrix} C \\ C \\ C \\ C \\ A \end{matrix} :$$



习题1.1($P_{30} - P_{32}$)

3.) 比 ì 图1.2, 其对应的关 é Ý 阵为

$$G_1 = \begin{pmatrix} 0 & & & & 1 \\ & 2 & 1 & 1 & 1 & 0 \\ & & 0 & 1 & 1 & 0 \\ & & & 0 & 0 & 1 \\ & & & & 0 & 1 \\ & & & & & 0 \end{pmatrix}$$

比 ì 图1.3, 其对应的关 é Ý 阵为

$$G_2 = \begin{pmatrix} 0 & & & & & & \\ & 1 & 0 & 0 & 0 & 0 & 1 \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \end{pmatrix}$$



习题1.1($P_{30} - P_{32}$)

3.) 比 ì 图1.2, 其对应的关 é Ý 阵为

$$G_1 = \begin{matrix} & 0 & & & & 1 \\ & 2 & 1 & 1 & 1 & 0 \\ \text{B} & 0 & 1 & 1 & 0 & 0 \\ \text{C} & 0 & 0 & 0 & 1 & 1 \\ \text{A} & 0 & 0 & 0 & 0 & 1 \end{matrix} :$$

比 ì 图1.3, 其对应的关 é Ý 阵为

$$G_2 = \begin{matrix} & 0 & & & & & \\ & 1 & 0 & 0 & 0 & 0 & 1 \\ \text{B} & 1 & 1 & 1 & 1 & 0 & 0 \\ \text{C} & & & & & & \\ \text{A} & & & & & & \end{matrix}$$



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$$G_1 = \begin{pmatrix} 0 & 1 & 1 & 1 & 0 \\ 2 & 1 & 1 & 1 & 0 \\ 0 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

比 ì 图1.3, 其对应的关 é Ý 阵为

$$G_2 = \begin{pmatrix} 0 & 1 \\ 1 & 0 \\ 0 & 1 \\ 0 & 1 \\ 0 & 0 \\ 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 & 0 & 1 \\ 1 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 1 & 1 & 1 \end{pmatrix}$$



习题1.1($P_{30} - P_{32}$)

4.(1))



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4.(1)) 是 梯形 $\dot{Y}$ 阵;



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4.(2)) 是 梯形 $\dot{Y}$ 阵; 不是规范 梯形 $\dot{Y}$ 阵. 第二行主
3 的列有别的非零 ;



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5.) 有8种不同的 (果.

$$\begin{array}{ccc} 0 & & 1 \\ 4 & 3 & 8 \\ \textcircled{B} 9 & 5 & 1 \textcircled{A} \\ 2 & 7 & 6 \end{array}$$



习题1.1($P_{30} - P_{32}$)

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5.) 有8种不同的 (果.

0	1	0	1
4	3	8	8
B	C	B	C
@9	5	1A	@1
2	7	6	6



习题1.1($P_{30} - P_{32}$)

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5.) 有8种不同的 (果.

0	4	3	8	1	0	8	3	4	1	0	6	1	8	1			
B	@	9	5	1	A	B	@	1	5	9	A	B	@	7	5	3	A
2	7	6					6	7	2					2	9	4	



习题1.1($P_{30} - P_{32}$)

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5.) 有8种不同的 (果.

0		1	0		1	0		1	0		1
4	3	8	8	3	4	6	1	8	8	1	6
B			B			B			B		
@9	5	1A	@1	5	9A	@7	5	3A	@3	5	7A
2	7	6	6	7	2	2	9	4	4	9	2



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5.) 有8种不同的 (果.

0	1	0	1	0	1	0	1
4	3	8	8	3	4	6	1
8	1	6	5	3	4	2	9
2	7	6	6	7	2	2	9
4	9	2	4	9	2	4	9
3	5	7	3	5	7	3	5
8	1	6	8	1	6	8	1



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0	1	0	1	0	1	0	1
4	3	8	8	3	4	6	1
B	C	B	C	B	C	B	C
@9	5	1A	@1	5	9A	@7	5
0	2	7	6	1	0	6	7
4	9	2	2	9	4	2	9
B	C	B	C	B	C	B	C
@3	5	7A	@7	5	3A	@3	5
8	1	6	6	1	8	4	9



习题1.1($P_{30} - P_{32}$)

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5.) 有8种不同的 (果.

0	1	0	1	0	1	0	1
4	3	8	8	3	4	6	1
8	1	6	6	7	2	9	4
2	7	6	1	0	6	7	2
4	9	2	2	9	4	6	7
3	5	7	3	7	5	1	5
8	1	6	6	1	8	8	3

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4.(1) 是 梯形 $\dot{Y}$ 阵; 也是规范 梯形 $\dot{Y}$ 阵;

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5.) 有8种不同的(果.

[illegible]

习题1.1($P_{30} - P_{32}$)

观察 P_{30} 和 P_{32} 的关系，会发现 P_{30} 和 P_{32} 之间的行、列互换和转置关系.



习题1.1($P_{30} - P_{32}$)

观察 的关系，会发现 之间的行、列互换和转置关系.

6.)



6.) 由图1.5可以得到 $A =$

	0	1	0	1
0	0	1	1	1
1	1	0	0	0
0	0	1	0	0
1	1	0	0	0

由题中 给法K计 , 得 $B = A^2 = \begin{pmatrix} 1 & 0 & 1 & 0 \\ 2 & 1 & 1 & 0 \\ 0 & 1 & 1 & 1 \\ 1 & 0 & 0 & 0 \\ 0 & 2 & 1 & 1 \end{pmatrix}$

Y 阵B中 b_{kl} 的意义是: ² 一次中转由k到l的航线数 p.



习题1.1($P_{30} - P_{32}$)

观察 的关系, 会发现 之间的行、列互换和转置关系.

6.) 由图1.5可以得到 $A =$

0	1	1	1
1	0	0	0
0	1	0	0
1	0	1	0

由题中 给法 K 计 , 得 $B = A^2 =$

2	1	1	0
0	1	1	1
1	0	0	0
0	2	1	1

$\hat{Y}$ 阵 B 中 b_{kl} 的意义是: 2 一次中转由 k 到 l 的航线数 p .
如 $b_{11} = 2$, 意 $\hat{0}$ 是由 1 出发, 2 一次中转到 1 的航线数是 2,
是 1



习题1.1($P_{30} - P_{32}$)

观察 的关系, 会发现 之间的行、列互换和转置关系.

6.) 由图1.5可以得到 $A =$

0	1	1	1
1	0	0	0
0	1	0	0
1	0	1	0

由题中 给法 K 计 , 得 $B = A^2 =$

2	1	1	0
0	1	1	1
1	0	0	0
0	2	1	1

$\hat{Y}$ 阵 B 中 b_{kl} 的意义是: 2 一次中转由 k 到 l 的航线数 p .
如 $b_{11} = 2$, 意 $\hat{0}$ 是由 1 出发, 2 一次中转到 1 的航线数是 2,
是 1 $\rightarrow$ 4



习题1.1($P_{30} - P_{32}$)

观察 的关系, 会发现 之间的行、列互换和转置关系.

6.) 由图1.5可以得到 $A =$

0	1	1	1
1	0	0	0
0	1	0	0
1	0	1	0

由题中 给法 K 计 , 得 $B = A^2 =$

2	1	1	0
0	1	1	1
1	0	0	0
0	2	1	1

$\hat{Y}$ 阵 B 中 b_{kl} 的意义是: 2 一次中转由 k 到 l 的航线数 p .
如 $b_{11} = 2$, 意 $\hat{0}$ 是由 1 出发, 2 一次中转到 1 的航线数是 2,
是 $1 \rightarrow 4 \rightarrow 1$;



习题1.1($P_{30} - P_{32}$)

观察 的关系, 会发现 之间的行、列互换和转置关系.

6.) 由图1.5可以得到 $A =$

0	1	1	1
1	0	0	0
0	1	0	0
1	0	1	0

由题中 给法 K 计 , 得 $B = A^2 =$

2	1	1	0
0	1	1	1
1	0	0	0
0	2	1	1

$\hat{Y}$ 阵 B 中 b_{kl} 的意义是: 2 一次中转由 k 到 l 的航线数 p .
 如 $b_{11} = 2$, 意 $\hat{0}$ 是由 1 出发, 2 一次中转到 1 的航线数是 2,
 是 $1 \rightarrow 4 \rightarrow 1$;



习题1.1($P_{30} - P_{32}$)

观察 的关系, 会发现 之间的行、列互换和转置关系.

6.) 由图1.5可以得到 $A =$

0	1	1	1
1	0	0	0
0	1	0	0
1	0	1	0

由题中 给法 K 计 , 得 $B = A^2 =$

2	1	1	0
0	1	1	1
1	0	0	0
0	2	1	1

$\hat{Y}$ 阵 B 中 b_{kl} 的意义是: 2 一次中转由 k 到 l 的航线数 p .
 如 $b_{11} = 2$, 意 $\hat{0}$ 是由 1 出发, 2 一次中转到 1 的航线数是 2,
 是 $1 \rightarrow 4 \rightarrow 1$; $1 \rightarrow 2$



习题1.1($P_{30} - P_{32}$)

观察 的关系, 会发现 之间的行、列互换和转置关系.

6.) 由图1.5可以得到 $A =$

0	1	1	1
1	0	0	0
0	1	0	0
1	0	1	0

由题中 给法 K 计, 得 $B = A^2 =$

2	1	1	0
0	1	1	1
1	0	0	0
0	2	1	1

$\hat{Y}$ 阵 B 中 b_{kl} 的意义是: 2 一次中转由 k 到 l 的航线数 p .
 如 $b_{11} = 2$, 意 $\hat{0}$ 是由 1 出发, 2 一次中转到 1 的航线数是 2,
 是 $1 \rightarrow 4 \rightarrow 1$; $1 \rightarrow 2 \rightarrow 1$;



习题1.1($P_{30} - P_{32}$)

如 $b_{42} = 2$, 意 0 是由4出发, 2 一次中转到2的航线数是2, 是4



习题1.1($P_{30} - P_{32}$)

如 $b_{42} = 2$, 意 $\bar{0}$ 是由4出发, 2 一次中转到2的航线数是2, $4 \rightarrow 1$



习题1.1($P_{30} - P_{32}$)

如 $b_{42} = 2$, 意 $\bar{0}$ 是由4出发, 2 一次中转到2的航线数是2,
是 $4 \rightarrow 1 \rightarrow 2$;



习题1.1($P_{30} - P_{32}$)

如 $b_{42} = 2$, 意 $\bar{0}$ 是由4出发, 2 一次中转到2的航线数是2, $4 \rightarrow 1 \rightarrow 2$; 4



习题1.1($P_{30} - P_{32}$)

如 $b_{42} = 2$, 意 $\bar{0}$ 是由4出发, 2 一次中转到2的航线数是2,
是 $4 \rightarrow 1 \rightarrow 2; 4 \rightarrow 3$



习题1.1($P_{30} - P_{32}$)

如 $b_{42} = 2$, 意 $\bar{0}$ 是由4出发, 2 一次中转到2的航线数是2, 是 $4 \rightarrow 1 \rightarrow 2; 4 \rightarrow 3 \rightarrow 2$.



习题1.2($P_{33} - P_{36}$)

1.(1))



习题1.2($P_{33} - P_{36}$)

$$1.(1) \quad \begin{pmatrix} 0 & 1 \\ 12 & 26 \\ -27 & 2 \\ 23 & 4 \end{pmatrix} = \begin{pmatrix} B & C \\ A & A \end{pmatrix};$$



习题1.2($P_{33} - P_{36}$)

$$1.(1) \rightarrow \begin{pmatrix} 0 & 1 \\ 12 & 26 \\ -27 & 2 \\ 23 & 4 \end{pmatrix} \begin{matrix} B \\ C \\ A \end{matrix}; \quad 1.(2) \rightarrow$$



习题1.2($P_{33} - P_{36}$)

$$1.(1) \quad \begin{pmatrix} 0 & 1 \\ 12 & 26 \\ -27 & 2 \\ 23 & 4 \end{pmatrix} \begin{matrix} B \\ A \end{matrix} ; \quad 1.(2) \quad \begin{pmatrix} 0 & 1 \\ a_1 + a_2 + a_3 & \\ b_1 + b_2 + b_3 & \\ c_1 + c_2 + c_3 & \end{pmatrix} \begin{matrix} B \\ C \\ A \end{matrix} ;$$



习题1.2($P_{33} - P_{36}$)

$$1.(1) \rightarrow \begin{matrix} 0 & 1 \\ 12 & 26 \\ \text{B} & \text{C} \\ @-27 & 2 \text{ A} \\ 23 & 4 \end{matrix}; \quad 1.(2) \rightarrow \begin{matrix} 0 & 1 \\ a_1 + a_2 + a_3 & \\ \text{B} & \text{C} \\ @b_1 + b_2 + b_3 \text{ A} \\ c_1 + c_2 + c_3 \end{matrix};$$

$$1.(3) \rightarrow$$



习题1.2($P_{33} - P_{36}$)

$$1.(1) \rightarrow \begin{pmatrix} 0 & 1 \\ 12 & 26 \\ -27 & 2 \\ 23 & 4 \end{pmatrix} \begin{matrix} B \\ C \\ A \end{matrix}; \quad 1.(2) \rightarrow \begin{pmatrix} 0 & 1 \\ a_1 + a_2 + a_3 & \\ b_1 + b_2 + b_3 & \\ c_1 + c_2 + c_3 & \end{pmatrix} \begin{matrix} B \\ C \\ A \end{matrix};$$

$$1.(3) \rightarrow 27;$$



习题1.2($P_{33} - P_{36}$)

$$1.(1) \rightarrow \begin{pmatrix} 0 & 1 \\ 12 & 26 \\ -27 & 2 \\ 23 & 4 \end{pmatrix} \begin{matrix} B \\ C \\ A \end{matrix}; \quad 1.(2) \rightarrow \begin{pmatrix} 0 & 1 \\ a_1 + a_2 + a_3 & \\ b_1 + b_2 + b_3 & \\ c_1 + c_2 + c_3 & \end{pmatrix} \begin{matrix} B \\ C \\ A \end{matrix};$$

$$1.(3) \rightarrow 27; \quad 1.(4) \rightarrow$$



习题1.2($P_{33} - P_{36}$)

$$\begin{aligned}
 1.(1) &= \begin{pmatrix} 0 & 1 \\ 12 & 26 \\ 23 & 4 \end{pmatrix} \begin{matrix} B \\ A \end{matrix} ; \quad 1.(2) = \begin{pmatrix} 0 & 1 \\ a_1 + a_2 + a_3 & b_1 + b_2 + b_3 \\ c_1 + c_2 + c_3 & 1 \end{pmatrix} \begin{matrix} B \\ A \end{matrix} ; \\
 1.(3) &= 27 ; \quad 1.(4) = \begin{pmatrix} 0 & 4 & 7 & 9 \\ 8 & 14 & 18 \\ 4 & 7 & 9 \end{pmatrix} \begin{matrix} B \\ A \end{matrix} ;
 \end{aligned}$$



习题1.2($P_{33} - P_{36}$)

$$1.(1) \rightarrow \begin{pmatrix} 0 & 1 \\ 12 & 26 \\ -27 & 2 \end{pmatrix} \begin{matrix} B \\ C \\ A \end{matrix}; \quad 1.(2) \rightarrow \begin{pmatrix} 0 & 1 \\ a_1 + a_2 + a_3 & \\ b_1 + b_2 + b_3 & \\ c_1 + c_2 + c_3 & \end{pmatrix} \begin{matrix} B \\ C \\ A \end{matrix};$$

$$1.(3) \rightarrow \begin{pmatrix} 0 & 4 & 7 & 9 \\ 8 & 14 & 18 \\ 4 & 7 & 9 \end{pmatrix} \begin{matrix} B \\ C \\ A \end{matrix};$$

$$1.(5) \rightarrow$$



习题1.2($P_{33} - P_{36}$)

$$1.(1) \rightarrow \begin{pmatrix} 0 & 1 \\ 12 & 26 \\ -27 & 2 \end{pmatrix} \begin{matrix} B \\ C \\ A \end{matrix}; \quad 1.(2) \rightarrow \begin{pmatrix} 0 & 1 \\ a_1 + a_2 + a_3 & \\ b_1 + b_2 + b_3 & \\ c_1 + c_2 + c_3 & \end{pmatrix} \begin{matrix} B \\ C \\ A \end{matrix};$$

$$1.(3) \rightarrow \begin{pmatrix} 23 & 4 \\ 27 & \end{pmatrix}; \quad 1.(4) \rightarrow \begin{pmatrix} 0 & 4 & 7 & 9 \\ 8 & 14 & 18 \\ 4 & 7 & 9 \end{pmatrix} \begin{matrix} B \\ C \\ A \end{matrix};$$

$$1.(5) \rightarrow \begin{pmatrix} 6 & -7 & 8 \\ 20 & -5 & -6 \end{pmatrix} !;$$







习题1.2($P_{33} - P_{36}$)

$$1.(1) \rightarrow \begin{matrix} 0 & 1 \\ 12 & 26 \\ B & C \\ @ & A \\ -27 & 2 \\ 23 & 4 \end{matrix} ; \quad 1.(2) \rightarrow \begin{matrix} 0 & 1 \\ a_1 + a_2 + a_3 \\ B & C \\ @ & A \\ b_1 + b_2 + b_3 \\ c_1 + c_2 + c_3 \end{matrix} ;$$

$$1.(3) \rightarrow \begin{matrix} 0 & 4 & 7 & 9 \\ B & C \\ @ & A \\ 8 & 14 & 18 \\ 4 & 7 & 9 \end{matrix} ; \quad 1.(4) \rightarrow \begin{matrix} 0 & 4 & 7 & 9 \\ B & C \\ @ & A \\ 8 & 14 & 18 \\ 4 & 7 & 9 \end{matrix} ;$$

$$1.(5) \rightarrow \begin{matrix} 6 & -7 & 8 \\ 20 & -5 & -6 \end{matrix} ; \quad 1.(6) \rightarrow \begin{matrix} 0 & 7 & 28 & 67 \\ B & C \\ @ & A \\ 0 & 40 & 104 \\ 0 & 0 & 72 \end{matrix} ;$$

$$1.(7) \rightarrow$$



习题1.2($P_{33} - P_{36}$)

$$1.(1) \rightarrow \begin{matrix} 0 & 1 \\ 12 & 26 \\ \text{B} & \text{C} \\ @ & -27 & 2 & \text{A} \end{matrix} ; \quad 1.(2) \rightarrow \begin{matrix} 0 & 1 \\ a_1 + a_2 + a_3 & \\ \text{B} & \text{C} \\ @ & b_1 + b_2 + b_3 & \text{A} \end{matrix} ;$$

$$\begin{matrix} 23 & 4 \\ 27 & \end{matrix} ; \quad 1.(4) \rightarrow \begin{matrix} 0 & 1 \\ c_1 + c_2 + c_3 & \\ \text{B} & \text{C} \\ @ & 8 & 14 & 18 & \text{A} \end{matrix} ;$$

$$1.(5) \rightarrow \begin{matrix} 6 & -7 & 8 \\ 20 & -5 & -6 \end{matrix} ; \quad 1.(6) \rightarrow \begin{matrix} 0 & 1 \\ 7 & 28 & 67 \\ \text{B} & \text{C} \\ @ & 0 & 40 & 104 & \text{A} \\ 0 & 0 & 72 \end{matrix} ;$$

$$1.(7) \rightarrow \begin{matrix} 0 & 1 \\ d_1 a_1 & d_1 a_2 & d_1 a_3 \\ \text{B} & \text{C} \\ @ & d_2 b_1 & d_2 b_2 & d_2 b_3 & \text{A} \\ d_3 c_1 & d_3 c_2 & d_3 c_3 \end{matrix} ;$$



习题1.2($P_{33} - P_{36}$)

1.(8))



习题1.2($P_{33} - P_{36}$)

$$1.(8) \quad \begin{matrix} 0 & & 1 \\ & d_1 a_1 & d_2 a_2 & d_3 a_3 \\ \text{B} & @ & & \text{C} \\ & d_1 b_1 & d_2 b_2 & d_3 b_3 \\ & & d_1 c_1 & d_2 c_2 & d_3 c_3 \end{matrix} A ;$$



习题1.2($P_{33} - P_{36}$)

$$1.(8) \quad \begin{pmatrix} 0 & & 1 \\ d_1 a_1 & d_2 a_2 & d_3 a_3 \\ d_1 b_1 & d_2 b_2 & d_3 b_3 \\ d_1 c_1 & d_2 c_2 & d_3 c_3 \end{pmatrix} = \begin{matrix} B \\ @ \\ A \end{matrix} \begin{matrix} C \\ A \end{matrix} ; \quad 1.(10)$$



习题1.2($P_{33} - P_{36}$)

$$1.(8) = \begin{matrix} 0 & & 1 \\ & d_1a_1 & d_2a_2 & d_3a_3 \\ \textcircled{B} & d_1b_1 & d_2b_2 & d_3b_3 \\ & d_1c_1 & d_2c_2 & d_3c_3 \end{matrix} \textcircled{A} ; \quad 1.(10) = 19 ;$$



习题1.2($P_{33} - P_{36}$)

$$1.(8) = \begin{matrix} & 0 & & 1 \\ & d_1a_1 & d_2a_2 & d_3a_3 \\ \begin{matrix} B \\ @ \end{matrix} & d_1b_1 & d_2b_2 & d_3b_3 \\ & d_1c_1 & d_2c_2 & d_3c_3 \end{matrix} \begin{matrix} \\ \\ C \\ A \end{matrix} ; \quad 1.(10) = 19 ;$$

$$1.(9) =$$



习题1.2($P_{33} - P_{36}$)

$$1.(8) = \begin{matrix} 0 & & 1 \\ & d_1a_1 & d_2a_2 & d_3a_3 \\ \textcircled{B} & d_1b_1 & d_2b_2 & d_3b_3 \\ & d_1c_1 & d_2c_2 & d_3c_3 \end{matrix} \textcircled{A} ; \quad 1.(10) = 19 ;$$

$$1.(9) = a_{11}x^2 + 2a_{12}xy + 2a_{13}x + a_{22}y^2 + 2a_{23}y + a_{33} ;$$



习题1.2($P_{33} - P_{36}$)

$$1.(8) = \begin{matrix} 0 & & 1 \\ & d_1a_1 & d_2a_2 & d_3a_3 \\ \textcircled{B} & d_1b_1 & d_2b_2 & d_3b_3 \\ & d_1c_1 & d_2c_2 & d_3c_3 \end{matrix} \textcircled{A} ; \quad 1.(10) = 19 ;$$

$$1.(9) = a_{11}x^2 + 2a_{12}xy + 2a_{13}x + a_{22}y^2 + 2a_{23}y + a_{33} ;$$

$$2.)$$



习题1.2($P_{33} - P_{36}$)

$$1.(8) = \begin{matrix} & 0 & & 1 \\ & d_1a_1 & d_2a_2 & d_3a_3 \\ \begin{matrix} \text{B} \\ @ \end{matrix} & d_1b_1 & d_2b_2 & d_3b_3 \\ & d_1c_1 & d_2c_2 & d_3c_3 \end{matrix} \begin{matrix} \\ \\ \text{C} \\ \text{A} \end{matrix} ; \quad 1.(10) = 19 ;$$

$$1.(9) = \begin{matrix} 0 & & & 1 \\ & a_{11}x^2 + 2a_{12}xy + 2a_{13}x + a_{22}y^2 + 2a_{23}y + a_0 \\ & & & \end{matrix} ;$$

$$2.) = \begin{matrix} & d_1a_{11} & d_1a_{12} & \cdots & d_1a_{1n} \\ \begin{matrix} \text{B} \\ @ \end{matrix} & d_2a_{21} & d_2a_{22} & \cdots & d_2a_{2n} \\ & \vdots & \vdots & & \vdots \\ & d_na_{n1} & d_na_{n2} & \cdots & d_na_{nn} \end{matrix} \begin{matrix} \\ \\ \text{C} \\ \text{C} \\ \text{C} \\ \text{A} \end{matrix} ;$$



习题1.2($P_{33} - P_{36}$)

$$1.(8) = \begin{matrix} & 0 & & 1 \\ & d_1a_1 & d_2a_2 & d_3a_3 \\ \text{B} & @ & d_1b_1 & d_2b_2 & d_3b_3 & \text{C} \\ & & d_1c_1 & d_2c_2 & d_3c_3 & \text{A} \end{matrix} ; \quad 1.(10) = 19 ;$$

$$1.(9) = \begin{matrix} 0 & & & 1 \\ & a_{11}x^2 & + 2a_{12}xy & + 2a_{13}x & + a_{22}y^2 & + 2a_{23}y & + a_0 \end{matrix} ;$$

$$2.) = \begin{matrix} & d_1a_{11} & d_1a_{12} & \cdots & d_1a_{1n} \\ \text{B} & @ & d_2a_{21} & d_2a_{22} & \cdots & d_2a_{2n} \\ & & \vdots & & \vdots & \vdots \\ & & d_na_{n1} & d_na_{n2} & \cdots & d_na_{nn} \end{matrix} \begin{matrix} \text{C} \\ \text{C} \\ \text{C} \\ \text{A} \end{matrix} ;$$

)



习题1.2($P_{33} - P_{36}$)

$$1.(8) = \begin{matrix} & 0 & & 1 \\ & d_1a_1 & d_2a_2 & d_3a_3 \\ \text{B} & @ & d_1b_1 & d_2b_2 & d_3b_3 \\ & d_1c_1 & d_2c_2 & d_3c_3 \end{matrix} \text{C} \text{A} ; \quad 1.(10) = 19 ;$$

$$1.(9) \quad \underset{0}{=} \quad a_{11}x^2 + 2a_{12}xy + \underset{1}{2a_1x} + a_{22}y^2 + 2a_2y + a_0 \quad ;$$

$$2.) = \begin{pmatrix} d_1 a_{11} & d_1 a_{12} & \cdots & d_1 a_{1n} \\ d_2 a_{21} & d_2 a_{22} & \cdots & d_2 a_{2n} \\ \vdots & \vdots & & \vdots \end{pmatrix};$$

$$) = \begin{pmatrix} d_1 a_{11} & d_1 a_{12} & \cdots & d_1 a_{1n} \\ d_2 a_{11} & d_2 a_{12} & \cdots & d_2 a_{1n} \\ \vdots & \vdots & \ddots & \vdots \\ d_n a_{11} & d_n a_{12} & \cdots & d_n a_{1n} \end{pmatrix}$$



习题1.2($P_{33} - P_{36}$)

3.)



习题1.2($P_{33} - P_{36}$)

3.)

$$A + B = \begin{pmatrix} 1 & 2 & 1 \\ 1 & 2 & 1 \end{pmatrix} ;$$





习题1.2($P_{33} - P_{36}$)

3.)

$$A + B = \begin{pmatrix} 1 & 2 & 1 \\ 1 & 2 & 1 \\ 3 & -2 & -3 \end{pmatrix};$$

$$A - B = \begin{pmatrix} 5 & 0 & -5 \\ 8 & -4 & -7 \\ 13 & 1 & -12 \end{pmatrix};$$

$$3A - 2B = \begin{pmatrix} 8 & -4 & -7 \\ 13 & 1 & -12 \end{pmatrix};$$



习题1.2($P_{33} - P_{36}$)

4.)



习题1.2($P_{33} - P_{36}$)

4.)

$$AB = \begin{pmatrix} 0 & 5 & 8 \\ 0 & -5 & 6 \\ 2 & 9 & 0 \end{pmatrix} \begin{matrix} B \\ C \\ A \end{matrix};$$



习题1.2($P_{33} - P_{36}$)

4.)

$$\begin{aligned}
 AB &= \begin{pmatrix} 0 & 5 & 8 \\ 0 & -5 & 6 \\ 0 & 9 & 0 \end{pmatrix} \\
 BA &= \begin{pmatrix} 2 & 0 & 1 \\ 6 & 2 & 6 \\ 1 & -7 & 5 \end{pmatrix}
 \end{aligned}$$



习题1.2($P_{33} - P_{36}$)

4.)

$$\begin{aligned}
 AB &= \begin{pmatrix} 0 & 5 & 8 \\ 0 & -5 & 6 \\ 0 & 9 & 0 \end{pmatrix} \begin{pmatrix} 1 \\ 0 \\ 1 \end{pmatrix}; \\
 BA &= \begin{pmatrix} 2 & 9 & 0 \\ 6 & 0 & 2 \\ 1 & -7 & 5 \end{pmatrix} \begin{pmatrix} 1 \\ 0 \\ 1 \end{pmatrix}; \\
 B^T A^T &= \begin{pmatrix} 6 & 4 & -4 \\ 0 & 0 & 2 \\ 5 & -5 & 9 \end{pmatrix} \begin{pmatrix} 1 \\ 0 \\ 1 \end{pmatrix}; \\
 &\quad \begin{pmatrix} 8 & 6 & 0 \end{pmatrix}
 \end{aligned}$$



习题1.2($P_{33} - P_{36}$)

5.(1))



习题1.2($P_{33} - P_{36}$)

$$5.(1) \quad \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} ;$$



习题1.2($P_{33} - P_{36}$)

$$5.(1) \quad \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix};$$

$$5.(2) \quad \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$$



习题1.2($P_{33} - P_{36}$)

$$5.(1) \quad \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix};$$

$$5.(2) \quad \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix} = \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix};$$



习题1.2($P_{33} - P_{36}$)

$$5.(1) \quad \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} ;$$

$$5.(2) \quad \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix} ;$$

$$5.(3) \quad \begin{pmatrix} \end{pmatrix}$$



习题1.2($P_{33} - P_{36}$)

$$5.(1) \quad \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix};$$

$$5.(2) \quad \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix} = \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix};$$

$$\begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix} \quad n = 1;$$

$$5.(3) \quad \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix};$$



习题1.2($P_{33} - P_{36}$)

$$5.(1) = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix};$$

$$5.(2) = \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix};$$

$$\begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix} \quad n=1;$$

$$\begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix} \quad n=2;$$

$$5.(3) = \begin{pmatrix} \vdots \\ \vdots \\ \vdots \end{pmatrix}.$$



习题1.2($P_{33} - P_{36}$)

$$\begin{aligned}
 5.(1) & \quad \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} ; \\
 5.(2) & \quad \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix} ; \\
 & \quad \begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix} \quad n=1; \\
 & \quad \begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix} \quad n=2; \\
 5.(3) & \quad \begin{pmatrix} 1 & 3 \\ 0 & 1 \end{pmatrix} \quad n=3;
 \end{aligned}$$



习题1.2($P_{33} - P_{36}$)

$$\begin{aligned}
 5.(1) & \quad \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} ; \\
 5.(2) & \quad \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix} ; \\
 & \quad \begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix} \quad n=1; \\
 & \quad \begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix} \quad n=2; \\
 5.(3) & \quad \begin{pmatrix} 1 & 3 \\ 0 & 1 \end{pmatrix} \quad n=3; \\
 & \quad \vdots \quad \vdots \\
 & \quad \begin{pmatrix} 1 & n \\ 0 & 1 \end{pmatrix} \quad \forall n:
 \end{aligned}$$



习题1.2($P_{33} - P_{36}$)

5.(4))



习题1.2($P_{33} - P_{36}$)

8	0		1
0	0	1	0
B	0	0	1
@	0	0	0

5.(4)) =

.



习题1.2($P_{33} - P_{36}$)

$$5.(4) = \begin{pmatrix} 8 & 0 & 1 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{matrix} B \\ @ \\ 0 \\ B \\ @ \\ 0 \\ 0 \end{matrix} \begin{matrix} C \\ A \\ 1 \\ C \\ A \\ C \\ A \end{matrix} \begin{matrix} n = 1; \\ \\ \\ n = 2; \\ \\ n \geq 3: \end{matrix}$$



习题1.2($P_{33} - P_{36}$)

5.(5))



习题1.2($P_{33} - P_{36}$)

$$5.(5) \text{) 记 } A = \begin{pmatrix} 0 & 0 & 1 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} B = \begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{pmatrix};$$



习题1.2($P_{33} - P_{36}$)

$$5.(5) \text{) 记 } A = \begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{pmatrix} B = \begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{pmatrix} C;$$

由于A是数域F上的3阶幂零阵，所以A与B可换，从而有



习题1.2($P_{33} - P_{36}$)

$$5.(5) \text{) 记 } A = \begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{pmatrix}; B = \begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{pmatrix};$$

由于A是数域F上的矩阵，以A与B可换，从而有

$$(A + B)^n = A^n + C_n^1 A^{n-1} B + C_n^2 A^{n-2} B^2 + C_n^3 A^{n-3} B^3 + \dots$$



习题1.2($P_{33} - P_{36}$)

$$5.(5) \text{) 记 } A = \begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{pmatrix} = \begin{pmatrix} B & C \\ 0 & A \end{pmatrix}; \quad B = \begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{pmatrix} = \begin{pmatrix} B & C \\ 0 & A \end{pmatrix};$$

由于 A 是数域 $\mathbb{F}$ 上的 3×3 矩阵， A 与 B 可交换，从而有

$$(A + B)^n = A^n + C_n^1 A^{n-1} B + C_n^2 A^{n-2} B^2 + C_n^3 A^{n-3} B^3 + \dots$$

$$\text{而 } A^m = \begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{pmatrix}^m = \begin{pmatrix} 0 & m & 0 \\ 0 & 0 & m \\ 0 & 0 & 0 \end{pmatrix}; \quad \forall m \text{ 为正整数};$$



习题1.2($P_{33} - P_{36}$)

$$5.(5) \text{) 记 } A = \begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{pmatrix} B = \begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{pmatrix};$$

由于A是数域F上的矩阵，以A与B可换，从而有

$$(A + B)^n = A^n + C_n^1 A^{n-1} B + C_n^2 A^{n-2} B^2 + C_n^3 A^{n-3} B^3 + \dots$$

$$\text{而 } A^m = \begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{pmatrix}^m; \forall m \text{ 为正整数};$$

2 | 用5.(4)的(论,



习题1.2($P_{33} - P_{36}$)

$$C_n^1 A^{n-1} B = \begin{pmatrix} 0 & C_n^{1 \ n-1} & 0 & 1 \\ 0 & 0 & C_n^{1 \ n-1} & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix} C_n^1 A^{n-1} B;$$



习题1.2($P_{33} - P_{36}$)

$$\begin{aligned}
 C_n^1 A^{n-1} B &= \begin{pmatrix} 0 & C_n^{1 \ n-1} & 0 & 1 \\ 0 & 0 & C_n^{1 \ n-1} & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & C_n^{2 \ n-2} & 0 \end{pmatrix} \begin{pmatrix} B \\ A \end{pmatrix}; \\
 C_n^2 A^{n-2} B^2 &= \begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} B \\ A \end{pmatrix};
 \end{aligned}$$



习题1.2($P_{33} - P_{36}$)

$$\begin{aligned}
 C_n^1 A^{n-1} B &= \begin{pmatrix} 0 & C_n^1 & 0 & 1 \\ 0 & 0 & C_n^1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{pmatrix} A; \\
 C_n^2 A^{n-2} B^2 &= \begin{pmatrix} 0 & 0 & C_n^2 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix} A; \\
 C_n^m A^{n-m} B^m &= \begin{pmatrix} 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix} A: \quad 3 \leq m \leq n:
 \end{aligned}$$



习题1.2($P_{33} - P_{36}$)

以,

$$\begin{pmatrix} 0 & 1 & 0 \\ B @ 0 & 1 & C \\ 0 & 0 & 1 \end{pmatrix} = \begin{pmatrix} 8 & 0 & 1 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

$$n = 1;$$



习题1.2($P_{33} - P_{36}$)

以，

[illegible]

习题1.2($P_{33} - P_{36}$)

以,

$$\begin{aligned}
 & \begin{pmatrix} 0 & 1 & 0 & 1_n \\ B @ 0 & & 1 C A \\ 0 & 0 & & \end{pmatrix} = \begin{pmatrix} 0 & 1 & 0 & 1 \\ B @ 0 & & 1 C A \\ 0 & 0 & & \end{pmatrix} \quad n=1; \\
 & \begin{pmatrix} 0 & 1 & 0 & 1_n \\ B @ 0 & & 1 C A \\ 0 & 0 & & \end{pmatrix} = \begin{pmatrix} 0 & 1 & 0 & 1 \\ B @ 0 & & 1 C A \\ 0 & 0 & & \end{pmatrix} \quad n=2; \\
 & \begin{pmatrix} 0 & 1 & 0 & 1_n \\ B @ 0 & & 1 C A \\ 0 & 0 & & \end{pmatrix} = \begin{pmatrix} 0 & 1 & 0 & 1 \\ B @ 0 & & 1 C A \\ 0 & 0 & & \end{pmatrix} \quad n \geq 3:
 \end{aligned}$$



习题1.2($P_{33} - P_{36}$)

6.(1))



习题1.2($P_{33} - P_{36}$)

$$f(A) =$$



习题1.2($P_{33} - P_{36}$)

$$f(A) = A^2 - A - I_3$$

$$=$$



习题1.2($P_{33} - P_{36}$)

6.(1)

$$\begin{aligned}
 f(A) &= A^2 - A - I_3 \\
 &= \begin{pmatrix} 0 & 3 & 1 \\ 1 & 1 & 2 \\ 1 & -1 & 0 \end{pmatrix} \begin{pmatrix} 0 & 3 & 1 \\ 1 & 1 & 2 \\ 1 & -1 & 0 \end{pmatrix} - \begin{pmatrix} 0 & 3 & 1 \\ 1 & 1 & 2 \\ 1 & -1 & 0 \end{pmatrix} - \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \\
 &= \begin{pmatrix} 0 & 3 & 1 \\ 1 & 1 & 2 \\ 1 & -1 & 0 \end{pmatrix} \begin{pmatrix} 0 & 3 & 1 \\ 1 & 1 & 2 \\ 1 & -1 & 0 \end{pmatrix} - \begin{pmatrix} 0 & 3 & 1 \\ 1 & 1 & 2 \\ 1 & -1 & 0 \end{pmatrix} - \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \\
 &=
 \end{aligned}$$



习题1.2($P_{33} - P_{36}$)

6.(1)

$$\begin{aligned}
 f(A) &= A^2 - A - I_3 \\
 &= \begin{pmatrix} 0 & 1 & 1 \\ 3 & 1 & 1 \\ 1 & 2 & 2 \end{pmatrix} - \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \\
 &= \begin{pmatrix} -1 & 1 & 1 \\ 3 & 0 & 1 \\ 1 & 2 & 1 \end{pmatrix} \\
 &= \begin{pmatrix} -1 & 1 & 1 \\ 3 & 0 & 1 \\ 1 & 2 & 1 \end{pmatrix}
 \end{aligned}$$



习题1.2($P_{33} - P_{36}$)

6.(1)

$$\begin{aligned}
 f(A) &= A^2 - A - I_3 \\
 &= \begin{pmatrix} 0 & 3 & 1 \\ 1 & 1 & 2 \\ 0 & 1 & 0 \end{pmatrix} \begin{pmatrix} 0 & 1 & 0 \\ 1 & 1 & 2 \\ 0 & 1 & 0 \end{pmatrix} - \begin{pmatrix} 0 & 1 & 0 \\ 1 & 1 & 2 \\ 0 & 1 & 0 \end{pmatrix} - \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \\
 &= \begin{pmatrix} 0 & 1 & -1 \\ 1 & 3 & 5 \\ 0 & 1 & 1 \end{pmatrix} \begin{pmatrix} 0 & 1 & 0 \\ 1 & 1 & 2 \\ 0 & 1 & 0 \end{pmatrix} - \begin{pmatrix} 0 & 1 & 0 \\ 1 & 1 & 2 \\ 0 & 1 & 0 \end{pmatrix} - \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \\
 &= \begin{pmatrix} 0 & 0 & -1 \\ 1 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} 0 & 1 & 0 \\ 1 & 1 & 2 \\ 0 & 1 & 0 \end{pmatrix} - \begin{pmatrix} 0 & 1 & 0 \\ 1 & 1 & 2 \\ 0 & 1 & 0 \end{pmatrix} - \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \\
 &= \begin{pmatrix} 0 & 9 & 2 \\ 1 & 1 & 0 \\ -1 & 1 & -2 \end{pmatrix} \begin{pmatrix} 0 & 1 & 0 \\ 1 & 1 & 2 \\ 0 & 1 & 0 \end{pmatrix} - \begin{pmatrix} 0 & 1 & 0 \\ 1 & 1 & 2 \\ 0 & 1 & 0 \end{pmatrix} - \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}
 \end{aligned}$$



习题1.2($P_{33} - P_{36}$)

6.(2))



习题1.2($P_{33} - P_{36}$)

$$f(A) = 6.(2))$$



习题1.2($P_{33} - P_{36}$)

$$f(A) = A^2 - 5A + 3I_2$$



习题1.2($P_{33} - P_{36}$)

6.(2)

$$\begin{aligned}
 f(A) &= A^2 - 5A + 3I_2 \\
 &= \begin{pmatrix} 2 & -1 \\ -3 & 3 \end{pmatrix} - 5 \begin{pmatrix} 2 & -1 \\ -3 & 3 \end{pmatrix} + 3 \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \\
 &=
 \end{aligned}$$



习题1.2($P_{33} - P_{36}$)

6.(2)

$$\begin{aligned}
 f(A) &= A^2 - 5A + 3I_2 \\
 &= \begin{pmatrix} 2 & -1 \\ -3 & 3 \end{pmatrix} - 5 \begin{pmatrix} 2 & -1 \\ -3 & 3 \end{pmatrix} + 3 \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \\
 &= \begin{pmatrix} 7 & -5 \\ -15 & 12 \end{pmatrix} - \begin{pmatrix} 10 & -5 \\ -15 & 15 \end{pmatrix} + \begin{pmatrix} 3 & 0 \\ 0 & 3 \end{pmatrix} \\
 &=
 \end{aligned}$$



习题1.2($P_{33} - P_{36}$)

6.(2)

$$\begin{aligned}
 f(A) &= A^2 - 5A + 3I_2 \\
 &= \begin{pmatrix} 2 & -1 \\ -3 & 3 \end{pmatrix} - 5 \begin{pmatrix} 2 & -1 \\ -3 & 3 \end{pmatrix} + 3 \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \\
 &= \begin{pmatrix} 7 & -5 \\ -15 & 12 \end{pmatrix} - \begin{pmatrix} 10 & -5 \\ -15 & 15 \end{pmatrix} + \begin{pmatrix} 3 & 0 \\ 0 & 3 \end{pmatrix} \\
 &= \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}
 \end{aligned}$$



习题1.2($P_{33} - P_{36}$)

6.(3)



习题1.2($P_{33} - P_{36}$)

$$6.(3))$$

$$f(A) =$$



习题1.2($P_{33} - P_{36}$)

6.(3)

$$f(A) = A^2 - 3A + 5I_2$$

=



习题1.2($P_{33} - P_{36}$)

6.(3)

$$\begin{aligned}
 f(A) &= A^2 - 3A + 5I_2 \\
 &= \begin{pmatrix} a & 0 \\ 0 & b \end{pmatrix}^2 - 3 \begin{pmatrix} a & 0 \\ 0 & b \end{pmatrix} + 5 \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \\
 &=
 \end{aligned}$$



习题1.2($P_{33} - P_{36}$)

6.(3)

$$\begin{aligned}
 f(A) &= A^2 - 3A + 5I_2 \\
 &= \begin{pmatrix} a & 0 \\ 0 & b \end{pmatrix}^2 - 3 \begin{pmatrix} a & 0 \\ 0 & b \end{pmatrix} + 5 \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \\
 &= \begin{pmatrix} a^2 & 0 \\ 0 & b^2 \end{pmatrix} - \begin{pmatrix} 3a & 0 \\ 0 & 3b \end{pmatrix} + \begin{pmatrix} 5 & 0 \\ 0 & 5 \end{pmatrix} \\
 &=
 \end{aligned}$$



习题1.2($P_{33} - P_{36}$)

6.(3)

$$\begin{aligned}
 f(A) &= A^2 - 3A + 5I_2 \\
 &= \begin{pmatrix} a & 0 \\ 0 & b \end{pmatrix}^2 - 3 \begin{pmatrix} a & 0 \\ 0 & b \end{pmatrix} + 5 \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \\
 &= \begin{pmatrix} a^2 & 0 \\ 0 & b^2 \end{pmatrix} - \begin{pmatrix} 3a & 0 \\ 0 & 3b \end{pmatrix} + \begin{pmatrix} 5 & 0 \\ 0 & 5 \end{pmatrix} \\
 &= \begin{pmatrix} a^2 - 3a + 5 & 0 \\ 0 & b^2 - 3b + 5 \end{pmatrix}
 \end{aligned}$$



习题1.2($P_{33} - P_{36}$)

6.(3)

$$\begin{aligned}
 f(A) &= A^2 - 3A + 5I_2 \\
 &= \begin{pmatrix} a & 0 \\ 0 & b \end{pmatrix}^2 - 3 \begin{pmatrix} a & 0 \\ 0 & b \end{pmatrix} + 5 \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \\
 &= \begin{pmatrix} a^2 & 0 \\ 0 & b^2 \end{pmatrix} - \begin{pmatrix} 3a & 0 \\ 0 & 3b \end{pmatrix} + \begin{pmatrix} 5 & 0 \\ 0 & 5 \end{pmatrix} \\
 &= \begin{pmatrix} a^2 - 3a + 5 & 0 \\ 0 & b^2 - 3b + 5 \end{pmatrix} \\
 &= \begin{pmatrix} f(a) & 0 \\ 0 & f(b) \end{pmatrix}
 \end{aligned}$$





习题1.2($P_{33} - P_{36}$)

7.) 因为 $B^2 = I$, 以 $B^{2012} =$



习题1.2($P_{33} - P_{36}$)

7.) 因为 $B^2 = I$, 以 $B^{2012} = (B^2)^{506} =$





习题1.2($P_{33} - P_{36}$)

7.) 因为 $B^2 = I$, 以 $B^{2012} = (B^2)^{506} = I$;

$$B^{2012}AB^{2013} =$$



习题1.2($P_{33} - P_{36}$)

7.) 因为 $B^2 = I$, 以 $B^{2012} = (B^2)^{506} = I$;

$$B^{2012}AB^{2013} = IAB B^{2012} =$$



习题1.2($P_{33} - P_{36}$)

7.) 因为 $B^2 = I$, 以 $B^{2012} = (B^2)^{506} = I$;

$$B^{2012}AB^{2013} = IAB B^{2012} = AB =$$



习题1.2($P_{33} - P_{36}$)

7.) 因为 $B^2 = I$, 以 $B^{2012} = (B^2)^{506} = I$;

$$B^{2012}AB^{2013} = IAB B^{2012} = AB = \begin{pmatrix} 1 & 2 & 0 & 1 \\ 3 & 4 & 1 & 0 \end{pmatrix} =$$



习题1.2($P_{33} - P_{36}$)

7.) 因为 $B^2 = I$, 以 $B^{2012} = (B^2)^{506} = I$;

$$B^{2012}AB^{2013} = IAB B^{2012} = AB = \begin{pmatrix} 1 & 2 & 0 & 1 \\ 3 & 4 & 1 & 0 \end{pmatrix} =$$

$$\begin{pmatrix} 2 & 1 \\ 4 & 3 \end{pmatrix}.$$



习题1.2($P_{33} - P_{36}$)

7.) 因为 $B^2 = I$, 以 $B^{2012} = (B^2)^{506} = I$;

$$B^{2012}AB^{2013} = IAB B^{2012} = AB = \begin{pmatrix} 1 & 2 & 0 & 1 \\ 3 & 4 & 1 & 0 \end{pmatrix} = \begin{pmatrix} 2 & 1 \\ 4 & 3 \end{pmatrix}.$$

8.)



习题1.2($P_{33} - P_{36}$)

7.) 因为 $B^2 = I$, 以 $B^{2012} = (B^2)^{506} = I$;

$$B^{2012}AB^{2013} = IAB B^{2012} = AB = \begin{pmatrix} 1 & 2 & 0 & 1 \\ 3 & 4 & 1 & 0 \end{pmatrix} =$$

$$\begin{pmatrix} 2 & 1 \\ 4 & 3 \end{pmatrix}.$$

8.) $x^T A x =$



习题1.2($P_{33} - P_{36}$)

7.) 因为 $B^2 = I$, 以 $B^{2012} = (B^2)^{506} = I$;

$$B^{2012}AB^{2013} = IAB B^{2012} = AB = \begin{pmatrix} 1 & 2 & 0 & 1 \\ 3 & 4 & 1 & 0 \end{pmatrix} =$$

$$\begin{pmatrix} 2 & 1 \\ 4 & 3 \end{pmatrix}.$$

$$8.) \quad x^T A x = \begin{pmatrix} x_1 & x_2 & x_3 \end{pmatrix} \begin{pmatrix} 0 & 1 & 0 \\ 1 & 2 & 1 \\ 3 & 4 & 0 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix}$$



习题1.2($P_{33} - P_{36}$)

7.) 因为 $B^2 = I$, 以 $B^{2012} = (B^2)^{506} = I$;

$$B^{2012}AB^{2013} = IAB B^{2012} = AB = \begin{pmatrix} 1 & 2 & 0 & 1 \\ 3 & 4 & 1 & 0 \end{pmatrix} =$$

$$\begin{pmatrix} 2 & 1 \\ 4 & 3 \end{pmatrix}.$$

$$8.) x^T A x = \begin{pmatrix} x_1 & x_2 & x_3 \end{pmatrix} \begin{pmatrix} 0 & 1 & 0 & 1 \\ 1 & 2 & 1 & 0 \\ 3 & 4 & 0 & 0 \\ 0 & 1 & 2 & 0 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} =$$

$$x_1^2 + 5x_1x_2 + x_1x_3 + 4x_2^2 + x_2x_3 + 2x_3^2.$$



习题1.2($P_{33} - P_{36}$)

7.) 因为 $B^2 = I$, 以 $B^{2012} = (B^2)^{506} = I$;

$$B^{2012}AB^{2013} = IAB B^{2012} = AB = \begin{pmatrix} 1 & 2 & 0 & 1 \\ 3 & 4 & 1 & 0 \end{pmatrix} =$$



习题1.2($P_{33} - P_{36}$)

7.) 因为 $B^2 = I$, 以 $B^{2012} = (B^2)^{506} = I$;

$$B^{2012}AB^{2013} = IAB B^{2012} = AB = \begin{pmatrix} 1 & 2 & 0 & 1 \\ 3 & 4 & 1 & 0 \end{pmatrix} =$$

$$\begin{pmatrix} 2 & 1 \\ 4 & 3 \end{pmatrix}.$$

$$8.) x^T A x = \begin{pmatrix} x_1 & x_2 & x_3 \end{pmatrix} \begin{pmatrix} 0 & 1 & 0 & 1 \\ 1 & 2 & 1 & 0 \\ 3 & 4 & 0 & 0 \\ 0 & 1 & 2 & 0 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} =$$

$$x_1^2 + 5x_1x_2 + x_1x_3 + 4x_2^2 + x_2x_3 + 2x_3^2;$$

$$x^T A x = \begin{pmatrix} x_1 & x_2 & x_3 \end{pmatrix} \begin{pmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} =$$



习题1.2($P_{33} - P_{36}$)

7.) 因为 $B^2 = I$, 以 $B^{2012} = (B^2)^{506} = I$;

$$B^{2012}AB^{2013} = IAB B^{2012} = AB = \begin{pmatrix} 1 & 2 & 0 & 1 \\ 3 & 4 & 1 & 0 \end{pmatrix} =$$

$$\begin{pmatrix} 2 & 1 \\ 4 & 3 \end{pmatrix}.$$

$$8.) x^T A x = \begin{pmatrix} x_1 & x_2 & x_3 \end{pmatrix} \begin{pmatrix} 0 & 1 & 0 & 1 \\ 1 & 2 & 1 & 0 \\ 3 & 4 & 0 & 0 \\ 0 & 1 & 2 & 0 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} =$$

$$x_1^2 + 5x_1x_2 + x_1x_3 + 4x_2^2 + x_2x_3 + 2x_3^2;$$

$$x^T A x = \begin{pmatrix} x_1 & x_2 & x_3 \end{pmatrix} \begin{pmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = a_{11}x_1^2 +$$

$$(a_{12} + a_{21})x_1x_2 + (a_{13} + a_{31})x_1x_3 + a_{22}x_2^2 + (a_{23} + a_{32})x_2x_3 + a_{33}x_3^2.$$

习题1.2($P_{33} - P_{36}$)

9.)



习题1.2($P_{33} - P_{36}$)

$$9.) = I + B + B^2 - B - B^2 - B^3 =$$



习题1.2($P_{33} - P_{36}$)

$$9.) = I + B + B^2 - B - B^2 - B^3 = I - B^3 =$$



习题1.2($P_{33} - P_{36}$)

$$9.) = I + B + B^2 - B - B^2 - B^3 = I - B^3 = I.$$



习题1.2($P_{33} - P_{36}$)

$$9.) = I + B + B^2 - B - B^2 - B^3 = I - B^3 = I.$$

10.)



习题1.2($P_{33} - P_{36}$)

$$9.) = I + B + B^2 - B - B^2 - B^3 = I - B^3 = I.$$

10.) | 用 $\dot{Y}$ 阵乘法的 (合律, 有



习题1.2($P_{33} - P_{36}$)

$$9.) = I + B + B^2 - B - B^2 - B^3 = I - B^3 = I.$$

$$10.) \quad | \text{用 } Y \text{ 阵乘法的 (合律, 有 } (\quad^T)^2 =$$











习题1.2($P_{33} - P_{36}$)

$$9.) = I + B + B^2 - B - B^2 - B^3 = I - B^3 = I.$$

10.) | 用 $\dot{Y}$ 阵乘法的 (合律, 有 $(\quad^T)^2 = (\quad^T)^T$,

而 $(\quad^T)$ 是一个 $1 \times 1 \dot{Y}$ 阵, 其与 $\dot{Y}$ 阵的乘积可以看作

数 $(\quad^T)$ 与 $\dot{Y}$ 阵的积, 以 $(\quad^T)^T = (\quad^T)^T$,

$$\text{而 } (\quad^T)^2 = \begin{pmatrix} 1 & -1 & 1 \\ -1 & 1 & -1 \\ 1 & -1 & 1 \end{pmatrix} \begin{pmatrix} 3 & -3 & 3 \\ -3 & 3 & -3 \\ 3 & -3 & 3 \end{pmatrix} = \begin{pmatrix} 0 & 1_2 & 0 \\ 1 & -1 & 1 \\ 3 & -3 & 3 \end{pmatrix} = \begin{pmatrix} 0 & 1 & 0 \\ 1 & -1 & 1 \\ 3 & -3 & 3 \end{pmatrix}$$





习题1.2($P_{33} - P_{36}$)

9. $) = I + B + B^2 - B - B^2 - B^3 = I - B^3 = I.$

10.) | 用 Y 阵乘法的 (合律, 有 $(\quad^T)^2 = (\quad^T)^T$,

而 $(\quad^T)$ 是一个 1×1 阵, 其与 $\dot{Y}$ 阵的乘积可以看作

数 $\begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix}$ 与 $\dot{Y}$ 阵的积, 以 $\begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix}^T = \begin{pmatrix} 1 & 0 \\ 2 & 1 \end{pmatrix}^T$,

$$\text{而} (\tau)^2 = \begin{pmatrix} 1 & -1 & 1 \\ -1 & 1 & -1 \\ 1 & -1 & 1 \end{pmatrix} \mathbf{A} = \begin{pmatrix} 3 & -3 & 3 \\ -3 & 3 & -3 \\ 3 & -3 & 3 \end{pmatrix} \mathbf{A} =$$

$$\begin{pmatrix} 0 & 1 & -1 & 1 \\ 1 & -1 & 1 & -1 \\ -1 & 1 & -1 & 1 \end{pmatrix} \text{A, 以 } \tau = 3.$$



习题1.2($P_{33} - P_{36}$)

11. 证



习题1.2($P_{33} - P_{36}$)

11. 证 因为 $B_1; B_2$ 都与 A 可换,



习题1.2($P_{33} - P_{36}$)

11. 证 因为 $B_1; B_2$ 都与 A 可换, 以
 $B_1A = AB_1; B_2A = AB_2$.



习题1.2($P_{33} - P_{36}$)

11. 证 因为 B_1, B_2 都与 A 可换, 以
 $B_1A = AB_1; B_2A = AB_2.$ 以
 $(B_1 + B_2)A =$



习题1.2($P_{33} - P_{36}$)

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 $B_1A = AB_1; B_2A = AB_2$. 以
 $(B_1 + B_2)A = B_1A + B_2A =$



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 $(B_1 + B_2)A = B_1A + B_2A = AB_1 + AB_2 =$



习题1.2($P_{33} - P_{36}$)

11. 证 因为 $B_1; B_2$ 都与 A 可换, 以
 $B_1A = AB_1; B_2A = AB_2$. 以
 $(B_1 + B_2)A = B_1A + B_2A = AB_1 + AB_2 = A(B_1 + B_2);$



习题1.2($P_{33} - P_{36}$)

11. 证 因为 B_1, B_2 都与 A 可换, 以

$$B_1A = AB_1; B_2A = AB_2. \quad \text{以}$$

$$(B_1 + B_2)A = B_1A + B_2A = AB_1 + AB_2 = A(B_1 + B_2);$$

$$(B_1B_2)A =$$



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$$(B_1B_2)A = B_1(B_2A) =$$



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习题1.2($P_{33} - P_{36}$)

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$B_1A = AB_1; B_2A = AB_2$. 以

$$(B_1 + B_2)A = B_1A + B_2A = AB_1 + AB_2 = A(B_1 + B_2);$$

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$$(B_1 + B_2)A = B_1A + B_2A = AB_1 + AB_2 = A(B_1 + B_2);$$

$$(B_1B_2)A = B_1(B_2A) = B_1(AB_2) = (B_1A)B_2 = (AB_1)B_2 =$$



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习题1.2($P_{33} - P_{36}$)

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$$(B_1 + B_2)A = B_1A + B_2A = AB_1 + AB_2 = A(B_1 + B_2);$$

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$B_1 + B_2, B_1B_2$ 与 A 可换.

12.)



习题1.2($P_{33} - P_{36}$)

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$$B_1A = AB_1; B_2A = AB_2. \quad \text{以}$$

$$(B_1 + B_2)A = B_1A + B_2A = AB_1 + AB_2 = A(B_1 + B_2);$$

$$(B_1B_2)A = B_1(B_2A) = B_1(AB_2) = (B_1A)B_2 = (AB_1)B_2 = A(B_1B_2);$$

$B_1 + B_2, B_1B_2$ 与 A 可换. !

12.) 因为 $AB = \begin{pmatrix} 6+a & 4+b \\ a-3 & b-2 \end{pmatrix},$



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$B_1 + B_2, B_1B_2$ 与 A 可换. !

12.) 因为 $AB = \begin{pmatrix} 6+a & 4+b \\ a-3 & b-2 \end{pmatrix}, BA = \begin{pmatrix} a+b & 2a-b \\ 5 & 4 \end{pmatrix}$!



习题1.2($P_{33} - P_{36}$)

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$$(B_1 + B_2)A = B_1A + B_2A = AB_1 + AB_2 = A(B_1 + B_2);$$

$$(B_1B_2)A = B_1(B_2A) = B_1(AB_2) = (B_1A)B_2 = (AB_1)B_2 = A(B_1B_2);$$

$B_1 + B_2, B_1B_2$ 与 A 可换. !

12.) 因为 $AB = \begin{pmatrix} 6+a & 4+b \\ a-3 & b-2 \end{pmatrix}, BA = \begin{pmatrix} a+b & 2a-b \\ 5 & 4 \end{pmatrix}$!

又因为 $AB = BA$, 即 $\begin{pmatrix} 6+a & 4+b \\ a-3 & b-2 \end{pmatrix} = \begin{pmatrix} a+b & 2a-b \\ 5 & 4 \end{pmatrix}$,



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$$(B_1 + B_2)A = B_1A + B_2A = AB_1 + AB_2 = A(B_1 + B_2);$$

$$(B_1B_2)A = B_1(B_2A) = B_1(AB_2) = (B_1A)B_2 = (AB_1)B_2 = A(B_1B_2);$$

$B_1 + B_2, B_1B_2$ 与 A 可换. !

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又因为 $AB = BA$, 即 $\begin{pmatrix} 6+a & 4+b \\ a-3 & b-2 \end{pmatrix} = \begin{pmatrix} a+b & 2a-b \\ 5 & 4 \end{pmatrix}$,

比 个 阵的 , 并由 阵的相等得 $\begin{matrix} a=8 \\ b=6 \end{matrix}$.



习题1.2($P_{33} - P_{36}$)

13.(1))



习题1.2($P_{33} - P_{36}$)

$$13.(1) \quad AX = b;$$



习题1.2($P_{33} - P_{36}$)

$$13.(1) \quad AX = b;$$

$$13.(2) \quad$$



习题1.2($P_{33} - P_{36}$)

$$13.(1) \quad AX = b;$$

$$13.(2) \quad YB = c;$$



习题1.2($P_{33} - P_{36}$)

$$13.(1) \quad AX = b;$$

$$13.(2) \quad YB = c;$$

$$13.(3) \quad$$



习题1.2($P_{33} - P_{36}$)

$$13.(1) \quad AX = b;$$

$$13.(2) \quad YB = c;$$

$$13.(3) \quad B = A^T; Y = X^T; c = b^T,$$



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$$13.(1) \quad AX = b;$$

$$13.(2) \quad YB = c;$$

$$13.(3) \quad B = A^T; Y = X^T; c = b^T, \\ (AX)^T = X^T A^T = YB.$$



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$$13.(1) \quad AX = b;$$

$$13.(2) \quad YB = c;$$

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$$14. \quad)$$



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$$13.(1) \quad AX = b;$$

$$13.(2) \quad YB = c;$$

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$$(AX)^T = X^T A^T = YB. \quad !$$

$$14. \quad \text{~如, } A = \begin{pmatrix} 1 & 1 \\ -1 & -1 \end{pmatrix}; B = \begin{pmatrix} 1 & -1 \\ -1 & 1 \end{pmatrix}, \quad !$$



习题1.2($P_{33} - P_{36}$)

13.(1)) $AX = b$;

13.(2)) $YB = c$;

13.(3)) $B = A^T$; $Y = X^T$; $c = b^T$,

$(AX)^T = X^T A^T = YB.$!

14.) ~ 如, $A = \begin{pmatrix} 1 & 1 \\ -1 & -1 \end{pmatrix}$; $B = \begin{pmatrix} 1 & -1 \\ -1 & 1 \end{pmatrix}$,

有 $(A + B)^2 =$



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$$13.(1) \quad AX = b;$$

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$$\text{有 } (A+B)^2 = \begin{pmatrix} 2 & 0 \\ -2 & 0 \end{pmatrix} =$$



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$$\text{有 } (A+B)^2 = \begin{pmatrix} 2 & 0 \\ -2 & 0 \end{pmatrix} = \begin{pmatrix} 4 & 0 \\ -4 & 0 \end{pmatrix},$$

$$\begin{aligned} & A^2 + 2AB + B^2 \\ &= \begin{pmatrix} 1 & 1 \\ -1 & -1 \end{pmatrix} + 2 \begin{pmatrix} 1 & 1 & 1 & -1 \\ -1 & -1 & -1 & 1 \end{pmatrix} + \begin{pmatrix} 1 & -1 \\ -1 & 1 \end{pmatrix} \\ &= \end{aligned}$$



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习题1.2($P_{33} - P_{36}$)

$$13.(1)) AX = b;$$

$$13.(2)) YB = c;$$

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$$(AX)^T = X^T A^T = YB.$$

$$14.) \sim \text{如}, A = \begin{pmatrix} 1 & 1 \\ -1 & -1 \end{pmatrix}; B = \begin{pmatrix} 1 & -1 \\ -1 & 1 \end{pmatrix},$$

$$\text{有}(A+B)^2 = \begin{pmatrix} 2 & 0 \\ -2 & 0 \end{pmatrix} = \begin{pmatrix} 4 & 0 \\ -4 & 0 \end{pmatrix},$$

$$\begin{aligned} & A^2 + 2AB + B^2 \\ &= \begin{pmatrix} 1 & 1 \\ -1 & -1 \end{pmatrix} + 2 \begin{pmatrix} 1 & 1 \\ -1 & -1 \end{pmatrix} + \begin{pmatrix} 1 & -1 \\ -1 & 1 \end{pmatrix} \\ &= \begin{pmatrix} 2 & -2 \\ -2 & 2 \end{pmatrix} \neq (A+B)^2. \end{aligned}$$



习题1.2($P_{33} - P_{36}$)

$$\begin{aligned} \text{因为 } (A + B)^2 &= A^2 + AB + BA + B^2, \quad \text{以} \\ (A + B)^2 &= A^2 + 2AB + B^2 \end{aligned}$$



习题1.2($P_{33} - P_{36}$)

因为 $(A + B)^2 = A^2 + AB + BA + B^2$, 以

$$(A + B)^2 = A^2 + 2AB + B^2$$

$$\Leftrightarrow A^2 + AB + BA + B^2 = A^2 + 2AB + B^2$$



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$$\Leftrightarrow AB = BA.$$



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即 $(A + B)^2 = A^2 + 2AB + B^2$ 的充要条件是 $AB = BA$.



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即 $(A + B)^2 = A^2 + 2AB + B^2$ 的充要条件是 $AB = BA$.

15.) 以 x_k 记第 k 周周末3校学生比率, 以 y_k 记第 k 周周末回

家学生比率,



习题1.2($P_{33} - P_{36}$)

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家学生比率, $K x_1 = \frac{70}{100}; y_1 = \frac{30}{100}$,



习题1.2($P_{33} - P_{36}$)

因为 $(A + B)^2 = A^2 + AB + BA + B^2$, 以

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家学生比率, $K x_1 = \frac{70}{100}; y_1 = \frac{30}{100}$, 且

$$\begin{aligned} x_{k+1} &= \frac{1}{5}x_k + \frac{3}{5}y_k \\ y_{k+1} &= \frac{4}{5}x_k + \frac{2}{5}y_k \end{aligned},$$



习题1.2($P_{33} - P_{36}$)

因为 $(A + B)^2 = A^2 + AB + BA + B^2$, 以

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即 $(A + B)^2 = A^2 + 2AB + B^2$ 的充要条件是 $AB = BA$.

15.) 以 x_k 记第 k 周周末3校学生比率, 以 y_k 记第 k 周周末回

家学生比率, $K \begin{cases} x_1 = \frac{70}{100}; y_1 = \frac{30}{100}, \text{ 且} \\ \end{cases} \begin{cases} x_{k+1} = \frac{1}{5}x_k + \frac{3}{5}y_k \\ y_{k+1} = \frac{4}{5}x_k + \frac{2}{5}y_k \end{cases},$

用 $\dot{Y}$ 阵表示, 即为 $\begin{pmatrix} x_{k+1} \\ y_{k+1} \end{pmatrix} = \begin{pmatrix} \frac{1}{5} & \frac{3}{5} \\ \frac{4}{5} & \frac{2}{5} \end{pmatrix} \begin{pmatrix} x_k \\ y_k \end{pmatrix}, k = 2; 3; 4; \dots$



习题1.2($P_{33} - P_{36}$)

因为 $(A + B)^2 = A^2 + AB + BA + B^2$, 以

$$(A + B)^2 = A^2 + 2AB + B^2$$

$$\Leftrightarrow A^2 + AB + BA + B^2 = A^2 + 2AB + B^2$$

$$\Leftrightarrow AB = BA.$$

即 $(A + B)^2 = A^2 + 2AB + B^2$ 的充要条件是 $AB = BA$.

15.) 以 x_k 记第 k 周周末3校学生比率, 以 y_k 记第 k 周周末回

家学生比率, $x_1 = \frac{70}{100}; y_1 = \frac{30}{100}$, 且

$$\begin{aligned} x_{k+1} &= \frac{1}{5}x_k + \frac{3}{5}y_k \\ y_{k+1} &= \frac{4}{5}x_k + \frac{2}{5}y_k \end{aligned}$$

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$$\begin{pmatrix} x_{k+1} \\ y_{k+1} \end{pmatrix} = \begin{pmatrix} \frac{1}{5} & \frac{3}{5} \\ \frac{4}{5} & \frac{2}{5} \end{pmatrix} \begin{pmatrix} x_k \\ y_k \end{pmatrix}, \quad k = 2; 3; 4; \dots$$

以

$$\begin{pmatrix} x_5 \\ y_5 \end{pmatrix} = \begin{pmatrix} \frac{1}{5} & \frac{3}{5} \\ \frac{4}{5} & \frac{2}{5} \end{pmatrix}^4 \begin{pmatrix} x_1 \\ y_1 \end{pmatrix},$$



习题1.2($P_{33} - P_{36}$)

$$\text{计} \quad \frac{\frac{1}{5}}{\frac{4}{5}} \frac{\frac{3}{5}}{\frac{2}{5}} \stackrel{!}{=} \frac{\frac{277}{625}}{\frac{348}{625}} \frac{\frac{261}{625}}{\frac{364}{625}} \stackrel{!}{,}$$



习题1.2($P_{33} - P_{36}$)

$$\begin{array}{l}
 \text{计} \\
 \text{以}
 \end{array}
 \begin{array}{c}
 \frac{1}{5} \quad \frac{3}{5} \\
 \frac{4}{5} \quad \frac{2}{5}
 \end{array}
 \begin{array}{c}
 !^4 \\
 !^5
 \end{array}
 =
 \begin{array}{c}
 \frac{277}{625} \quad \frac{261}{625} \\
 \frac{348}{625} \quad \frac{364}{625}
 \end{array}
 ,
 \begin{array}{c}
 ! \\
 !
 \end{array}
 \begin{array}{c}
 x_5 \\
 y_5
 \end{array}
 =
 \begin{array}{c}
 \frac{277}{625} \quad \frac{261}{625} \quad \frac{70}{100} \\
 \frac{348}{625} \quad \frac{364}{625} \quad \frac{30}{100}
 \end{array}$$



习题1.2($P_{33} - P_{36}$)

$$\begin{aligned}
 & \text{计} \quad \frac{1}{5} \frac{3}{5} \frac{!}{5} \frac{4}{5} = \frac{277}{625} \frac{261}{625} \frac{!}{625}, \\
 & \text{以} \quad x_5 = \frac{277}{625} \frac{261}{625} \frac{70}{100} \frac{!}{6250} = \frac{2722}{6250} \\
 & \quad y_5 = \frac{348}{625} \frac{364}{625} \frac{30}{100} \frac{!}{6250}
 \end{aligned}$$



习题1.2($P_{33} - P_{36}$)

$$\begin{aligned}
 & \text{计} \quad \frac{1}{5} \frac{3}{5} \frac{!}{5} \frac{4}{5} = \frac{277}{625} \frac{261}{625} \frac{!}{625}, \\
 & \text{以} \quad x_5 = \frac{277}{625} \frac{261}{625} \frac{70}{100} \frac{!}{100} = \frac{2722}{6250} \frac{!}{6250} \\
 & y_5 = \frac{348}{625} \frac{364}{625} \frac{30}{100} = \frac{3528}{6250}
 \end{aligned}$$

16.)



习题1.2($P_{33} - P_{36}$)

$$\begin{aligned}
 \text{计} \quad & \frac{1}{5} \frac{3}{5} \frac{!}{5} \frac{4}{5} = \frac{277}{625} \frac{261}{625} \frac{!}{625}, \\
 \text{以} \quad & x_5 = \frac{277}{625} \frac{261}{625} \frac{70}{100} = \frac{2722}{6250} \\
 & y_5 = \frac{348}{625} \frac{364}{625} \frac{30}{100} = \frac{3528}{6250}
 \end{aligned}$$

16.) 以 $x_k; y_k; z_k$ 分别表示三个年龄组(0~5、6~10、10~15) 3 $k \times 5$ 年后的动物数 p, K



习题1.2($P_{33} - P_{36}$)

$$\begin{aligned}
 \text{计} \quad & \frac{1}{5} \frac{3}{5} \frac{4}{5} = \frac{277}{625} \frac{261}{625}, \\
 \text{以} \quad & \frac{x_5}{y_5} = \frac{277}{625} \frac{261}{625} \frac{70}{100} = \frac{2722}{6250} \\
 & \frac{348}{625} \frac{364}{625} \frac{30}{100} = \frac{3528}{6250}
 \end{aligned}$$

16.) 以 x_k, y_k, z_k 分别表示三个年龄组(0~5、6~10、10~15) 3 k × 5年后的动物数 p, K

$$\geq x_{k+1} = 4y_k + 3z_k$$

$$\geq y_{k+1} = \frac{1}{2}x_k \quad ; k = 0; 1; 2; 3;$$

$$\geq z_{k+1} = \frac{1}{4}z_k$$



习题1.2($P_{33} - P_{36}$)

$$\text{计} \quad \frac{\frac{1}{5} \frac{3}{5} \frac{4}{5}}{\frac{4}{5} \frac{2}{5}} = \frac{\frac{277}{625} \frac{261}{625}}{\frac{348}{625} \frac{364}{625}},$$

$$\text{以} \quad \frac{x_5}{y_5} = \frac{\frac{277}{625} \frac{261}{625} \frac{70}{100}}{\frac{348}{625} \frac{364}{625} \frac{30}{100}} = \frac{\frac{2722}{6250}}{\frac{3528}{6250}}$$

16.) 以 x_k, y_k, z_k 分别表示三个年龄组(0~5、6~10、10~15) 3 k × 5年后的动物数 p, K

$$\begin{aligned} \geq x_{k+1} &= 4y_k + 3z_k & \geq x_0 &= 1000 \\ \geq y_{k+1} &= \frac{1}{2}x_k & \geq y_0 &= 1000, \\ \geq z_{k+1} &= \frac{1}{4}z_k & \geq z_0 &= 1000 \end{aligned}$$



习题1.2($P_{33} - P_{36}$)

$$\text{计} \quad \frac{\frac{1}{5} \frac{3}{5}}{\frac{4}{5} \frac{2}{5}} = \frac{\frac{277}{625} \frac{261}{625}}{\frac{348}{625} \frac{364}{625}},$$

$$\text{以} \quad \frac{x_5}{y_5} = \frac{\frac{277}{625} \frac{261}{625}}{\frac{348}{625} \frac{364}{625}} = \frac{\frac{70}{100}}{\frac{30}{100}} = \frac{\frac{2722}{6250}}{\frac{3528}{6250}}$$

16.) 以 x_k, y_k, z_k 分别表示三个年龄组(0~5、6~10、10~15) 3 k × 5年后的动物数 p, K

$$\begin{aligned} & \geq x_{k+1} = 4y_k + 3z_k & \geq x_0 = 1000 \\ & \geq y_{k+1} = \frac{1}{2}x_k & \geq y_0 = 1000, \\ & \geq z_{k+1} = \frac{1}{4}z_k & \geq z_0 = 1000 \end{aligned}$$

$$\begin{matrix} & x_{k+1} & & & & & x_k \\ \text{Y 阵表示, 即为} & \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix} & = & \begin{pmatrix} 0 & 4 & 3 \\ \frac{1}{2} & 0 & 0 \\ 0 & \frac{1}{4} & 0 \end{pmatrix} & \begin{pmatrix} x_k \\ y_k \\ z_k \end{pmatrix} \end{matrix}$$



习题1.2($P_{33} - P_{36}$)

15年后, $k = 2$,



习题1.2($P_{33} - P_{36}$)

$$\begin{aligned}
 & 15\text{年后}, k_0 = 2, \\
 & \begin{pmatrix} x_3 \\ y_3 \\ z_3 \end{pmatrix} = \begin{pmatrix} 0 & 4 & 3 \\ \frac{1}{2} & 0 & 0 \\ 0 & \frac{1}{4} & 0 \end{pmatrix} \begin{pmatrix} x_0 \\ y_0 \\ z_0 \end{pmatrix} + \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix} \\
 & \text{计 } Y\text{阵} \begin{pmatrix} \frac{1}{2} & 0 & 0 \\ 0 & \frac{1}{4} & 0 \end{pmatrix} = \begin{pmatrix} \frac{3}{8} & 8 & 6 \\ 1 & \frac{3}{8} & 0 \\ 0 & \frac{1}{2} & \frac{3}{8} \end{pmatrix} A,
 \end{aligned}$$



习题1.2($P_{33} - P_{36}$)15年后, $k=2$,

$$\begin{pmatrix} x_3 \\ y_3 \\ z_3 \end{pmatrix} = \begin{pmatrix} 0 & 4 & 3 \\ 1 & 0 & 0 \\ 0 & \frac{1}{2} & 0 \end{pmatrix} \begin{pmatrix} x_0 \\ y_0 \\ z_0 \end{pmatrix} + \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$$

$$\begin{pmatrix} x_3 \\ y_3 \\ z_3 \end{pmatrix} = \begin{pmatrix} 0 & 4 & 3 \\ 1 & 0 & 0 \\ 0 & \frac{1}{2} & 0 \end{pmatrix} \begin{pmatrix} x_0 \\ y_0 \\ z_0 \end{pmatrix} + \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$$

$$\begin{pmatrix} x_3 \\ y_3 \\ z_3 \end{pmatrix} = \begin{pmatrix} 0 & 4 & 3 \\ 1 & 0 & 0 \\ 0 & \frac{1}{2} & 0 \end{pmatrix} \begin{pmatrix} x_0 \\ y_0 \\ z_0 \end{pmatrix} + \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$$

$$\begin{pmatrix} x_3 \\ y_3 \\ z_3 \end{pmatrix} = \begin{pmatrix} 0 & 4 & 3 \\ 1 & 0 & 0 \\ 0 & \frac{1}{2} & 0 \end{pmatrix} \begin{pmatrix} x_0 \\ y_0 \\ z_0 \end{pmatrix} + \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$$

$$\begin{pmatrix} x_3 \\ y_3 \\ z_3 \end{pmatrix} = \begin{pmatrix} 0 & 4 & 3 \\ 1 & 0 & 0 \\ 0 & \frac{1}{2} & 0 \end{pmatrix} \begin{pmatrix} x_0 \\ y_0 \\ z_0 \end{pmatrix} + \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$$

$$\begin{pmatrix} x_3 \\ y_3 \\ z_3 \end{pmatrix} = \begin{pmatrix} 0 & 4 & 3 \\ 1 & 0 & 0 \\ 0 & \frac{1}{2} & 0 \end{pmatrix} \begin{pmatrix} x_0 \\ y_0 \\ z_0 \end{pmatrix} + \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$$

$$\begin{pmatrix} x_3 \\ y_3 \\ z_3 \end{pmatrix} = \begin{pmatrix} 0 & 4 & 3 \\ 1 & 0 & 0 \\ 0 & \frac{1}{2} & 0 \end{pmatrix} \begin{pmatrix} x_0 \\ y_0 \\ z_0 \end{pmatrix} + \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$$



习题1.2($P_{33} - P_{36}$)15年后, $k=2$,

$$\begin{pmatrix} x_3 \\ y_3 \\ z_3 \end{pmatrix} = \begin{pmatrix} 0 & 4 & 3 \\ 1 & 0 & 0 \\ 0 & \frac{1}{2} & 0 \end{pmatrix} \begin{pmatrix} x_0 \\ y_0 \\ z_0 \end{pmatrix}$$

$$\begin{pmatrix} x_3 \\ y_3 \\ z_3 \end{pmatrix} = \begin{pmatrix} 0 & 4 & 3 \\ 1 & 0 & 0 \\ 0 & \frac{1}{2} & 0 \end{pmatrix} \begin{pmatrix} x_0 \\ y_0 \\ z_0 \end{pmatrix}$$

$$\begin{pmatrix} x_3 \\ y_3 \\ z_3 \end{pmatrix} = \begin{pmatrix} 0 & 4 & 3 \\ 1 & 0 & 0 \\ 0 & \frac{1}{2} & 0 \end{pmatrix} \begin{pmatrix} x_0 \\ y_0 \\ z_0 \end{pmatrix}$$

$$\begin{pmatrix} x_3 \\ y_3 \\ z_3 \end{pmatrix} = \begin{pmatrix} 0 & 4 & 3 \\ 1 & 0 & 0 \\ 0 & \frac{1}{2} & 0 \end{pmatrix} \begin{pmatrix} x_0 \\ y_0 \\ z_0 \end{pmatrix}$$

$$\begin{pmatrix} x_3 \\ y_3 \\ z_3 \end{pmatrix} = \begin{pmatrix} 0 & 4 & 3 \\ 1 & 0 & 0 \\ 0 & \frac{1}{2} & 0 \end{pmatrix} \begin{pmatrix} x_0 \\ y_0 \\ z_0 \end{pmatrix}$$

$$\begin{pmatrix} x_3 \\ y_3 \\ z_3 \end{pmatrix} = \begin{pmatrix} 0 & 4 & 3 \\ 1 & 0 & 0 \\ 0 & \frac{1}{2} & 0 \end{pmatrix} \begin{pmatrix} x_0 \\ y_0 \\ z_0 \end{pmatrix}$$

$$\begin{pmatrix} x_3 \\ y_3 \\ z_3 \end{pmatrix} = \begin{pmatrix} 0 & 4 & 3 \\ 1 & 0 & 0 \\ 0 & \frac{1}{2} & 0 \end{pmatrix} \begin{pmatrix} x_0 \\ y_0 \\ z_0 \end{pmatrix}$$



习题1.2($P_{33} - P_{36}$)

17.)



习题1.2($P_{33} - P_{36}$)

(17.) 以 x_k, y_k 分别表示A; B公 第 k 年后的市场O有份额,

$$\begin{aligned}
 & \begin{matrix} K \\ x_{k+1} \\ y_{k+1} \end{matrix} = \begin{matrix} \frac{1}{4}x_k + \frac{1}{3}y_k \\ \frac{3}{4}x_k + \frac{2}{3}y_k \end{matrix}; \quad k = 0; 1; 2; \dots, \text{ 用 } Y \text{ 阵表示即为} \\
 & \begin{matrix} x_{k+1} \\ y_{k+1} \end{matrix} = \begin{pmatrix} \frac{1}{4} & \frac{1}{3} \\ \frac{3}{4} & \frac{2}{3} \end{pmatrix} \begin{matrix} x_k \\ y_k \end{matrix}; \quad \begin{matrix} x_0 \\ y_0 \end{matrix} = \begin{pmatrix} \frac{3}{5} \\ \frac{2}{5} \end{pmatrix},
 \end{aligned}$$



习题1.2($P_{33} - P_{36}$)

(17.) 以 x_k, y_k 分别表示A; B公 第 k 年后的市场O有份额,

K $x_{k+1} = \frac{1}{4}x_k + \frac{1}{3}y_k$; $k = 0; 1; 2; \dots$, 用 $\dot{Y}$ 阵表示即为

$$\begin{pmatrix} x_{k+1} \\ y_{k+1} \end{pmatrix} = \begin{pmatrix} \frac{1}{4} & \frac{1}{3} \\ \frac{3}{4} & \frac{2}{3} \end{pmatrix} \begin{pmatrix} x_k \\ y_k \end{pmatrix}; \quad \begin{pmatrix} x_0 \\ y_0 \end{pmatrix} = \begin{pmatrix} \frac{3}{5} \\ \frac{2}{5} \end{pmatrix},$$

以, 第2年后,

$$\begin{pmatrix} x_2 \\ y_2 \end{pmatrix} = \begin{pmatrix} \frac{1}{4} & \frac{1}{3} \\ \frac{3}{4} & \frac{2}{3} \end{pmatrix}^2 \begin{pmatrix} x_0 \\ y_0 \end{pmatrix},$$



习题1.2($P_{33} - P_{36}$)

(17.) 以 x_k, y_k 分别表示A; B公 第k年后的市场O有份额,

$$\begin{aligned} x_{k+1} &= \frac{1}{4}x_k + \frac{1}{3}y_k; \quad k = 0; 1; 2; \dots, \text{用 } Y \text{ 阵表示即为} \\ y_{k+1} &= \frac{3}{4}x_k + \frac{2}{3}y_k \end{aligned}$$

$$\begin{aligned} x_{k+1} &= \begin{bmatrix} \frac{1}{4} & \frac{1}{3} \\ \frac{3}{4} & \frac{2}{3} \end{bmatrix} \begin{bmatrix} x_k \\ y_k \end{bmatrix}; \quad \begin{bmatrix} x_0 \\ y_0 \end{bmatrix} = \begin{bmatrix} \frac{3}{5} \\ \frac{2}{5} \end{bmatrix}, \end{aligned}$$

$$\text{以, 第2年后,} \quad \begin{bmatrix} x_2 \\ y_2 \end{bmatrix} = \begin{bmatrix} \frac{1}{4} & \frac{1}{3} \\ \frac{3}{4} & \frac{2}{3} \end{bmatrix}^2 \begin{bmatrix} x_0 \\ y_0 \end{bmatrix},$$

$$\text{计} \quad \begin{bmatrix} \frac{1}{4} & \frac{1}{3} \\ \frac{3}{4} & \frac{2}{3} \end{bmatrix}^2 = \begin{bmatrix} \frac{5}{16} & \frac{11}{36} \\ \frac{11}{16} & \frac{25}{36} \end{bmatrix},$$



习题1.2($P_{33} - P_{36}$)

(17.) 以 x_k, y_k 分别表示A; B公 第 k 年后的市场O有份额,

K $x_{k+1} = \frac{1}{4}x_k + \frac{1}{3}y_k$; $k = 0; 1; 2; \dots$, 用Y阵表示即为

$$\begin{pmatrix} x_{k+1} \\ y_{k+1} \end{pmatrix} = \begin{pmatrix} \frac{1}{4} & \frac{1}{3} \\ \frac{3}{4} & \frac{2}{3} \end{pmatrix} \begin{pmatrix} x_k \\ y_k \end{pmatrix}; \quad \begin{pmatrix} x_0 \\ y_0 \end{pmatrix} = \begin{pmatrix} \frac{3}{5} \\ \frac{2}{5} \end{pmatrix},$$

以, 第2年后,

$$\begin{pmatrix} x_2 \\ y_2 \end{pmatrix} = \begin{pmatrix} \frac{1}{4} & \frac{1}{3} \\ \frac{3}{4} & \frac{2}{3} \end{pmatrix}^2 \begin{pmatrix} x_0 \\ y_0 \end{pmatrix},$$

计

$$\begin{pmatrix} \frac{1}{4} & \frac{1}{3} \\ \frac{3}{4} & \frac{2}{3} \end{pmatrix}^2 = \begin{pmatrix} \frac{5}{16} & \frac{11}{36} \\ \frac{11}{16} & \frac{25}{36} \end{pmatrix},$$

以,

$$\begin{pmatrix} x_2 \\ y_2 \end{pmatrix} = \begin{pmatrix} \frac{5}{16} & \frac{11}{36} \\ \frac{11}{16} & \frac{25}{36} \end{pmatrix} \begin{pmatrix} \frac{3}{5} \\ \frac{2}{5} \end{pmatrix} =$$



习题1.2($P_{33} - P_{36}$)

(17.) 以 x_k, y_k 分别表示A; B公 第 k 年后的市场O有份额,

K $x_{k+1} = \frac{1}{4}x_k + \frac{1}{3}y_k$; $k = 0; 1; 2; \dots$, 用 $\dot{Y}$ 阵表示即为

$$\begin{pmatrix} x_{k+1} \\ y_{k+1} \end{pmatrix} = \begin{pmatrix} \frac{1}{4} & \frac{1}{3} \\ \frac{3}{4} & \frac{2}{3} \end{pmatrix} \begin{pmatrix} x_k \\ y_k \end{pmatrix}; \quad \begin{pmatrix} x_0 \\ y_0 \end{pmatrix} = \begin{pmatrix} \frac{3}{5} \\ \frac{2}{5} \end{pmatrix},$$

以, 第2年后, $\begin{pmatrix} x_2 \\ y_2 \end{pmatrix} = \begin{pmatrix} \frac{1}{4} & \frac{1}{3} \\ \frac{3}{4} & \frac{2}{3} \end{pmatrix}^2 \begin{pmatrix} x_0 \\ y_0 \end{pmatrix},$

计 $\begin{pmatrix} \frac{1}{4} & \frac{1}{3} \\ \frac{3}{4} & \frac{2}{3} \end{pmatrix}^2 = \begin{pmatrix} \frac{5}{16} & \frac{11}{36} \\ \frac{11}{16} & \frac{25}{36} \end{pmatrix},$

以, $\begin{pmatrix} x_2 \\ y_2 \end{pmatrix} = \begin{pmatrix} \frac{5}{16} & \frac{11}{36} \\ \frac{11}{16} & \frac{25}{36} \end{pmatrix} \begin{pmatrix} \frac{3}{5} \\ \frac{2}{5} \end{pmatrix} = \begin{pmatrix} \frac{223}{720} \\ \frac{497}{720} \end{pmatrix}.$



习题1.2($P_{33} - P_{36}$)

$$\text{取 } P = \begin{pmatrix} 1 & 4 \\ -1 & 9 \end{pmatrix}, \quad K$$



习题1.2($P_{33} - P_{36}$)

$$\text{取 } P = \begin{pmatrix} 1 & 4 \\ -1 & 9 \end{pmatrix}, \quad K = \begin{pmatrix} 1 & 4 \\ -1 & 9 \end{pmatrix} = \begin{pmatrix} -\frac{1}{12} & 0 \\ 0 & 1 \end{pmatrix},$$



习题1.2($P_{33} - P_{36}$)

$$\begin{aligned}
 \text{取 } P &= \begin{pmatrix} 1 & 4 \\ -1 & 9 \end{pmatrix}, \quad K \\
 &= \begin{pmatrix} \frac{9}{13} & -\frac{4}{13} \\ \frac{1}{13} & \frac{1}{13} \end{pmatrix} = \begin{pmatrix} -\frac{1}{12} & 0 \\ 0 & 1 \end{pmatrix}, \quad \text{且} \\
 &= \begin{pmatrix} \frac{9}{13} & -\frac{4}{13} \\ \frac{1}{13} & \frac{1}{13} \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix},
 \end{aligned}$$



习题1.2($P_{33} - P_{36}$)

$$\text{取 } P = \begin{pmatrix} 1 & 4 \\ -1 & 9 \end{pmatrix}, K$$

$$\begin{pmatrix} \frac{9}{13} & -\frac{4}{13} \\ \frac{1}{13} & \frac{1}{13} \end{pmatrix} \begin{pmatrix} \frac{1}{4} & \frac{1}{3} \\ \frac{3}{4} & \frac{2}{3} \end{pmatrix} \begin{pmatrix} 1 & 4 \\ -1 & 9 \end{pmatrix} = \begin{pmatrix} -\frac{1}{12} & 0 \\ 0 & 1 \end{pmatrix}, \text{ 且 } \begin{pmatrix} \frac{9}{13} & -\frac{4}{13} \\ \frac{1}{13} & \frac{1}{13} \end{pmatrix} \begin{pmatrix} 1 & 4 \\ -1 & 9 \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix},$$

$$\text{从而 } \begin{pmatrix} \frac{9}{13} & -\frac{4}{13} \\ \frac{1}{13} & \frac{1}{13} \end{pmatrix} \begin{pmatrix} \frac{1}{4} & \frac{1}{3} \\ \frac{3}{4} & \frac{2}{3} \end{pmatrix} \begin{pmatrix} 1 & 4 \\ -1 & 9 \end{pmatrix}^{10} =$$

$$\begin{pmatrix} \frac{9}{13} & -\frac{4}{13} \\ \frac{1}{13} & \frac{1}{13} \end{pmatrix} \begin{pmatrix} \frac{1}{4} & \frac{1}{3} \\ \frac{3}{4} & \frac{2}{3} \end{pmatrix} \begin{pmatrix} 1 & 4 \\ -1 & 9 \end{pmatrix}$$



习题1.2($P_{33} - P_{36}$)

$$\text{取 } P = \begin{pmatrix} 1 & 4 \\ -1 & 9 \end{pmatrix}, K$$

$$\begin{pmatrix} \frac{9}{13} & -\frac{4}{13} \\ \frac{1}{13} & \frac{1}{13} \end{pmatrix} \begin{pmatrix} \frac{1}{4} & \frac{1}{3} \\ \frac{3}{4} & \frac{2}{3} \end{pmatrix} \begin{pmatrix} 1 & 4 \\ -1 & 9 \end{pmatrix} = \begin{pmatrix} -\frac{1}{12} & 0 \\ 0 & 1 \end{pmatrix}, \text{ 且 } \begin{pmatrix} \frac{9}{13} & -\frac{4}{13} \\ \frac{1}{13} & \frac{1}{13} \end{pmatrix} \begin{pmatrix} 1 & 4 \\ -1 & 9 \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix},$$

$$\text{从而 } \begin{pmatrix} \frac{9}{13} & -\frac{4}{13} \\ \frac{1}{13} & \frac{1}{13} \end{pmatrix} \begin{pmatrix} \frac{1}{4} & \frac{1}{3} \\ \frac{3}{4} & \frac{2}{3} \end{pmatrix} \begin{pmatrix} 1 & 4 \\ -1 & 9 \end{pmatrix} = \begin{pmatrix} -\frac{1}{12} & 0 \\ 0 & 1 \end{pmatrix}$$

$$\begin{pmatrix} \frac{9}{13} & -\frac{4}{13} \\ \frac{1}{13} & \frac{1}{13} \end{pmatrix} \begin{pmatrix} \frac{1}{4} & \frac{1}{3} \\ \frac{3}{4} & \frac{2}{3} \end{pmatrix} \begin{pmatrix} 1 & 4 \\ -1 & 9 \end{pmatrix} = \begin{pmatrix} -\frac{1}{12} & 0 \\ 0 & 1 \end{pmatrix}$$



习题1.2($P_{33} - P_{36}$)

$$\text{取 } P = \begin{pmatrix} 1 & 4 \\ -1 & 9 \end{pmatrix}, K$$

$$\begin{pmatrix} \frac{9}{13} & -\frac{4}{13} \\ \frac{1}{13} & \frac{1}{13} \end{pmatrix} \begin{pmatrix} \frac{1}{4} & \frac{1}{3} \\ \frac{3}{4} & \frac{2}{3} \end{pmatrix} \begin{pmatrix} 1 & 4 \\ -1 & 9 \end{pmatrix} = \begin{pmatrix} -\frac{1}{12} & 0 \\ 0 & 1 \end{pmatrix}, \text{ 且}$$

$$\begin{pmatrix} \frac{9}{13} & -\frac{4}{13} \\ \frac{1}{13} & \frac{1}{13} \end{pmatrix} \begin{pmatrix} 1 & 4 \\ -1 & 9 \end{pmatrix} = \begin{pmatrix} 1 & 4 \\ -1 & 9 \end{pmatrix} \begin{pmatrix} \frac{9}{13} & -\frac{4}{13} \\ \frac{1}{13} & \frac{1}{13} \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix},$$

$$\text{从而} \begin{pmatrix} \frac{9}{13} & -\frac{4}{13} \\ \frac{1}{13} & \frac{1}{13} \end{pmatrix} \begin{pmatrix} \frac{1}{4} & \frac{1}{3} \\ \frac{3}{4} & \frac{2}{3} \end{pmatrix} \begin{pmatrix} 1 & 4 \\ -1 & 9 \end{pmatrix} =$$

$$\begin{pmatrix} \frac{9}{13} & -\frac{4}{13} \\ \frac{1}{13} & \frac{1}{13} \end{pmatrix} \begin{pmatrix} \frac{1}{4} & \frac{1}{3} \\ \frac{3}{4} & \frac{2}{3} \end{pmatrix} \begin{pmatrix} 1 & 4 \\ -1 & 9 \end{pmatrix} = \begin{pmatrix} -\frac{1}{12} & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} \frac{9}{13} & -\frac{4}{13} \\ \frac{1}{13} & \frac{1}{13} \end{pmatrix},$$

$$\text{以} \begin{pmatrix} \frac{1}{4} & \frac{1}{3} \\ \frac{3}{4} & \frac{2}{3} \end{pmatrix} = \begin{pmatrix} 1 & 4 \\ -1 & 9 \end{pmatrix} \begin{pmatrix} -\frac{1}{12} & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} \frac{9}{13} & -\frac{4}{13} \\ \frac{1}{13} & \frac{1}{13} \end{pmatrix},$$



习题1.2($P_{33} - P_{36}$)

$$\text{由于 } \frac{1}{12^{10}} \approx 0, \quad \text{以 } \begin{pmatrix} -\frac{1}{12} & 0 \\ 0 & 1 \end{pmatrix}^{10} \approx \begin{pmatrix} 0 & 0 \\ 0 & 1 \end{pmatrix},$$



习题1.2($P_{33} - P_{36}$)

$$\text{由于 } \frac{1}{12^{10}} \approx 0, \quad \text{以 } \begin{pmatrix} -\frac{1}{12} & 0 \\ 0 & 1 \end{pmatrix}^{10} \approx \begin{pmatrix} 0 & 0 \\ 0 & 1 \end{pmatrix},$$

$$\text{以 } \begin{pmatrix} \frac{1}{4} & \frac{1}{3} \\ \frac{3}{4} & \frac{2}{3} \end{pmatrix}^{10} = \begin{pmatrix} \frac{4}{13} & \frac{4}{13} \\ \frac{9}{13} & \frac{9}{13} \end{pmatrix},$$



习题1.2($P_{33} - P_{36}$)

$$\text{由于 } \frac{1}{12^{10}} \approx 0, \quad \text{以 } \begin{pmatrix} -\frac{1}{12} & 0 \\ 0 & 1 \end{pmatrix}^{10} \approx \begin{pmatrix} 0 & 0 \\ 0 & 1 \end{pmatrix},$$

$$\text{以 } \begin{pmatrix} \frac{1}{4} & \frac{1}{3} \\ \frac{3}{4} & \frac{2}{3} \end{pmatrix}^{10} = \begin{pmatrix} \frac{4}{13} & \frac{4}{13} \\ \frac{9}{13} & \frac{9}{13} \end{pmatrix},$$

$$\begin{pmatrix} x_{10} \\ y_{10} \end{pmatrix} = \begin{pmatrix} \frac{4}{13} & \frac{4}{13} \\ \frac{9}{13} & \frac{9}{13} \end{pmatrix} \begin{pmatrix} 3 \\ 5 \end{pmatrix} =$$



习题1.2($P_{33} - P_{36}$)

由于 $\frac{1}{12^{10}} \approx 0$, 以 $\begin{pmatrix} -\frac{1}{12} & 0 \\ 0 & 1 \end{pmatrix}^{10} \approx \begin{pmatrix} 0 & 0 \\ 0 & 1 \end{pmatrix}$,

以 $\begin{pmatrix} \frac{1}{4} & \frac{1}{3} \\ \frac{3}{4} & \frac{2}{3} \end{pmatrix}^{10} = \begin{pmatrix} \frac{4}{13} & \frac{4}{13} \\ \frac{9}{13} & \frac{9}{13} \end{pmatrix}$,

$$\begin{pmatrix} x_{10} \\ y_{10} \end{pmatrix} = \begin{pmatrix} \frac{4}{13} & \frac{4}{13} \\ \frac{9}{13} & \frac{9}{13} \end{pmatrix} \begin{pmatrix} \frac{3}{5} \\ \frac{2}{5} \end{pmatrix} = \begin{pmatrix} \frac{4}{13} \\ \frac{9}{13} \end{pmatrix}$$



习题1.3($P_{36} - P_{38}$)

1.(1))



习题1.3($P_{36} - P_{38}$)

$$1.(1) \begin{pmatrix} 0 & 1 & -1 & 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 & 0 & 0 & 1 \end{pmatrix} \begin{matrix} B \\ C \\ A \end{matrix} =$$



习题1.3($P_{36} - P_{38}$)

$$1.(1) \begin{pmatrix} 0 & 1 & -1 & 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 0 & 1 & 0 \end{pmatrix} \begin{matrix} \text{B} \\ \text{A} \\ \text{A} \end{matrix} = \begin{pmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \begin{matrix} \text{C} \\ \text{B} \\ \text{C} \end{matrix};$$



习题1.3($P_{36} - P_{38}$)

$$1.(1) \quad \begin{pmatrix} 0 & 1 & -1 & 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 0 & 1 & 0 \end{pmatrix} \begin{matrix} \text{B} \\ \text{A} \\ \text{A} \end{matrix} = \begin{pmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \begin{matrix} \text{C} \\ \text{B} \\ \text{C} \end{matrix};$$

$$1.(2) \quad$$



习题1.3($P_{36} - P_{38}$)

$$\begin{array}{l}
 1.(1) \quad \begin{array}{cccccc} 0 & 1 & -1 & 0 & 1 & 1 \\ 0 & 1 & 0 & 0 & 1 & 0 \end{array} \begin{array}{c} \text{B} \\ \text{A} \end{array} = \begin{array}{cccccc} 1 & 0 & 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 & 1 & 0 \end{array} \begin{array}{c} \text{C} \\ \text{A} \end{array}; \\
 1.(2) \quad \begin{array}{cccccc} 0 & 0 & 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 & 0 & 1 \end{array} \begin{array}{c} \text{B} \\ \text{A} \end{array} = \begin{array}{cccccc} 0 & 0 & 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 0 & 1 \end{array} \begin{array}{c} \text{C} \\ \text{A} \end{array}
 \end{array}$$



习题1.3($P_{36} - P_{38}$)

$$1.(1) \quad \begin{pmatrix} 0 & 1 & -1 & 0 & 1 & 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 \end{pmatrix} \begin{matrix} B \\ C \\ B \\ A \end{matrix} = \begin{pmatrix} 0 & 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \end{pmatrix} \begin{matrix} B \\ C \\ A \end{matrix};$$

$$1.(2) \quad \begin{pmatrix} 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 \end{pmatrix} \begin{matrix} B \\ C \\ B \\ A \end{matrix} = \begin{pmatrix} 0 & 0 & 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 & 0 & 1 \end{pmatrix} \begin{matrix} B \\ C \\ A \end{matrix};$$



习题1.3($P_{36} - P_{38}$)

$$1.(1) \quad \begin{pmatrix} 0 & 1 & -1 & 0 & 1 & 1 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 \end{pmatrix} \begin{matrix} B \\ A \end{matrix} = \begin{pmatrix} 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 \end{pmatrix} \begin{matrix} B \\ A \end{matrix};$$

$$1.(2) \quad \begin{pmatrix} 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 0 & 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 \end{pmatrix} \begin{matrix} B \\ A \\ A \end{matrix} = \begin{pmatrix} 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 0 & 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 \end{pmatrix} \begin{matrix} B \\ A \\ A \end{matrix};$$

$$1.(3) \quad \begin{pmatrix} 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 \end{pmatrix}$$



习题1.3($P_{36} - P_{38}$)

$$1.(1) \quad \begin{pmatrix} 0 & 1 & -1 & 0 & 1 & 1 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 \end{pmatrix} \begin{matrix} B \\ A \end{matrix} = \begin{pmatrix} 0 & 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 \end{pmatrix} \begin{matrix} B \\ A \end{matrix};$$

$$1.(2) \quad \begin{pmatrix} 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 0 & 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 1 \end{pmatrix} \begin{matrix} B \\ A \end{matrix} = \begin{pmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \begin{matrix} B \\ A \end{matrix};$$

$$1.(3) \quad \begin{pmatrix} 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 2 & 0 & 0 & \frac{1}{2} & 0 & 0 & 0 & 1 \end{pmatrix} \begin{matrix} B \\ A \end{matrix} =$$



习题1.3($P_{36} - P_{38}$)

$$1.(1) \quad \begin{pmatrix} 0 & 1 & -1 & 0 & 1 & 1 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 \end{pmatrix} \begin{matrix} B \\ A \end{matrix} = \begin{pmatrix} 0 & 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 \end{pmatrix} \begin{matrix} B \\ A \end{matrix};$$

$$1.(2) \quad \begin{pmatrix} 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 0 & 1 & 0 & 0 & 1 \end{pmatrix} \begin{matrix} B \\ A \end{matrix} = \begin{pmatrix} 0 & 0 & 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 0 \end{pmatrix} \begin{matrix} B \\ A \end{matrix};$$

$$1.(3) \quad \begin{pmatrix} 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 & 1 \\ 1 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 \\ 0 & 2 & 0 & 0 & \frac{1}{2} & 0 & 0 & 1 & 0 & 1 \end{pmatrix} \begin{matrix} B \\ A \end{matrix} = \begin{pmatrix} 0 & 0 & 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 0 & 1 \end{pmatrix} \begin{matrix} B \\ A \end{matrix};$$



习题1.3($P_{36} - P_{38}$)

$$1.(1) \quad \begin{pmatrix} 0 & 1 & -1 & 0 & 1 & 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 \end{pmatrix} \begin{matrix} B \\ C \\ A \end{matrix} = \begin{pmatrix} 0 & 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 \end{pmatrix} \begin{matrix} B \\ C \\ A \end{matrix};$$

$$1.(2) \quad \begin{pmatrix} 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 0 & 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 \end{pmatrix} \begin{matrix} B \\ C \\ A \end{matrix} = \begin{pmatrix} 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{pmatrix} \begin{matrix} B \\ C \\ A \end{matrix};$$

$$1.(3) \quad \begin{pmatrix} 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 & 1 \\ 1 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 \\ 0 & 2 & 0 & \frac{1}{2} & 0 & 0 & 1 & 0 & 0 & 1 \end{pmatrix} \begin{matrix} B \\ C \\ A \end{matrix} = \begin{pmatrix} 0 & 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 \end{pmatrix} \begin{matrix} B \\ C \\ A \end{matrix};$$

$$1.(4) \quad$$



习题1.3($P_{36} - P_{38}$)

$$1.(1) \quad \begin{pmatrix} 0 & 1 & -1 & 0 & 1 & 1 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 \end{pmatrix} \begin{matrix} B \\ A \end{matrix} = \begin{pmatrix} 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 \end{pmatrix} \begin{matrix} B \\ A \end{matrix};$$

$$1.(2) \quad \begin{pmatrix} 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 0 & 1 & 0 & 0 & 1 \end{pmatrix} \begin{matrix} B \\ A \end{matrix} = \begin{pmatrix} 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 0 & 1 & 0 & 0 & 1 \end{pmatrix} \begin{matrix} B \\ A \end{matrix};$$

$$1.(3) \quad \begin{pmatrix} 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 & 1 \\ 1 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 \end{pmatrix} \begin{matrix} B \\ A \end{matrix} = \begin{pmatrix} 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 & 1 \\ 1 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 \end{pmatrix} \begin{matrix} B \\ A \end{matrix};$$

$$1.(4) \quad \begin{pmatrix} 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 \\ 2 & 0 & 0 & 1 & 0 & 1 & 0 & 0 & 1 \end{pmatrix} \begin{matrix} B \\ A \end{matrix} = \begin{pmatrix} 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 \\ 2 & 0 & 0 & 1 & 0 & 1 & 0 & 0 & 1 \end{pmatrix} \begin{matrix} B \\ A \end{matrix};$$



习题1.3($P_{36} - P_{38}$)

2.(1)



习题1.3($P_{36} - P_{38}$)

2.(1)证



习题1.3($P_{36} - P_{38}$)

2(1) 证 设 $a_1 a_2 \cdots a_n \neq 0$, 由 $\hat{Y}$ 阵的乘法直 可以验证

$$\begin{pmatrix} a_1 & 0 & \cdots & 0 \\ 0 & a_2 & \cdots & 0 \\ \vdots & \vdots & & \vdots \\ 0 & 0 & \cdots & a_n \end{pmatrix} \begin{pmatrix} \frac{1}{a_1} & 0 & \cdots & 0 \\ 0 & \frac{1}{a_2} & \cdots & 0 \\ \vdots & \vdots & & \vdots \\ 0 & 0 & \cdots & \frac{1}{a_n} \end{pmatrix} = \begin{pmatrix} 1 & 0 & \cdots & 0 \\ 0 & 1 & \cdots & 0 \\ \vdots & \vdots & & \vdots \\ 0 & 0 & \cdots & 1 \end{pmatrix}$$



习题1.3($P_{36} - P_{38}$)

2(1)证 设 $a_1 a_2 \cdots a_n \neq 0$, 由 $\dot{Y}$ 阵的乘法直 可以验证

$$\begin{pmatrix}
 a_1 & 0 & \cdots & 0 \\
 0 & a_2 & \cdots & 0 \\
 \vdots & \vdots & & \vdots \\
 0 & 0 & \cdots & a_n
 \end{pmatrix}
 \begin{pmatrix}
 \frac{1}{a_1} & 0 & \cdots & 0 \\
 0 & \frac{1}{a_2} & \cdots & 0 \\
 \vdots & \vdots & & \vdots \\
 0 & 0 & \cdots & \frac{1}{a_n}
 \end{pmatrix}
 =
 \begin{pmatrix}
 1 & 0 & \cdots & 0 \\
 0 & 1 & \cdots & 0 \\
 \vdots & \vdots & & \vdots \\
 0 & 0 & \cdots & 1
 \end{pmatrix}$$



习题1.3($P_{36} - P_{38}$)

2(1) 证 设 $a_1 a_2 \cdots a_n \neq 0$, 由 $\hat{Y}$ 阵的乘法直 可以验证

$$\begin{pmatrix} a_1 & 0 & \cdots & 0 \\ 0 & a_2 & \cdots & 0 \\ \vdots & \vdots & & \vdots \\ 0 & 0 & \cdots & a_n \end{pmatrix} \begin{pmatrix} \frac{1}{a_1} & 0 & \cdots & 0 \\ 0 & \frac{1}{a_2} & \cdots & 0 \\ \vdots & \vdots & & \vdots \\ 0 & 0 & \cdots & \frac{1}{a_n} \end{pmatrix} = \begin{pmatrix} 1 & 0 & \cdots & 0 \\ 0 & 1 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & 1 \end{pmatrix}$$



习题1.3($P_{36} - P_{38}$)

2(1)证 设 $a_1 a_2 \cdots a_n \neq 0$, 由 $\hat{Y}$ 阵的乘法直 可以验证

$$\begin{pmatrix} a_1 & 0 & \cdots & 0 \\ 0 & a_2 & \cdots & 0 \\ \vdots & \vdots & & \vdots \\ 0 & 0 & \cdots & a_n \end{pmatrix} \begin{pmatrix} \frac{1}{a_1} & 0 & \cdots & 0 \\ 0 & \frac{1}{a_2} & \cdots & 0 \\ \vdots & \vdots & & \vdots \\ 0 & 0 & \cdots & \frac{1}{a_n} \end{pmatrix} = \begin{pmatrix} 1 & 0 & \cdots & 0 \\ 0 & 1 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & 1 \end{pmatrix}$$

以 $\hat{Y}$ 阵 A 可逆, 且其逆为 给定的 $\hat{Y}$ 阵.



习题1.3($P_{36} - P_{38}$)

2(1) 证 设 $a_1 a_2 \cdots a_n \neq 0$, 由 $\dot{Y}$ 阵的乘法直 可以验证

$$\begin{pmatrix} a_1 & 0 & \cdots & 0 \\ 0 & a_2 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & a_n \end{pmatrix} \begin{pmatrix} \frac{1}{a_1} & 0 & \cdots & 0 \\ 0 & \frac{1}{a_2} & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & \frac{1}{a_n} \end{pmatrix} = \begin{pmatrix} 1 & 0 & \cdots & 0 \\ 0 & 1 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & 1 \end{pmatrix}$$

以 $\dot{Y}$ 阵 A 可逆, 且其逆为 给定的 $\dot{Y}$ 阵.

若 $a_1 a_2 \cdots a_n = 0$, 则存在 $a_k = 0$, $\dot{Y}$ 阵 A 的第 k 行全为 0, 此时对任意的 n 方阵 B ,



习题1.3($P_{36} - P_{38}$)

2(1)证 设 $a_1 a_2 \cdots a_n \neq 0$, 由 $\dot{Y}$ 阵的乘法直 可以验证

$$\begin{pmatrix} a_1 & 0 & \cdots & 0 \\ 0 & a_2 & \cdots & 0 \\ \vdots & \vdots & & \vdots \\ 0 & 0 & \cdots & a_n \end{pmatrix} \begin{pmatrix} \frac{1}{a_1} & 0 & \cdots & 0 \\ 0 & \frac{1}{a_2} & \cdots & 0 \\ \vdots & \vdots & & \vdots \\ 0 & 0 & \cdots & \frac{1}{a_n} \end{pmatrix} = \begin{pmatrix} 1 & 0 & \cdots & 0 \\ 0 & 1 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & 1 \end{pmatrix}$$

以 $\dot{Y}$ 阵 A 可逆, 且其逆为 给定的 $\dot{Y}$ 阵.

若 $a_1 a_2 \cdots a_n = 0$, 则存在 $a_k = 0$, $\dot{Y}$ 阵 A 的第 k 行全为 0, 此时对任意的 n 方阵 B , 由 $\dot{Y}$ 阵的乘法, 知 $\dot{Y}$ 阵 AB 的第 k 行也是 0,



习题1.3($P_{36} - P_{38}$)

阵 A 不可能是可逆 $\dot{Y}$ 阵.



习题1.3($P_{36} - P_{38}$)

阵 A 不可能是可逆 $\mathbb{Y}$ 阵. 以 $\mathbb{Y}$ 阵 A 可逆, K 有 $a_1 a_2 \cdots a_n \neq 0$.





习题1.3($P_{36} - P_{38}$)

阵 A 不可能是可逆 $\dot{Y}$ 阵. 以 $\dot{Y}$ 阵 A 可逆, K
 有 $a_1 a_2 \cdots a_n \neq 0$. 以 $\dot{Y}$ 阵 A 可逆的充要条件是 $a_1 a_2 \cdots a_n \neq 0$.
 2.(2)



习题1.3($P_{36} - P_{38}$)

阵 A 不可能是可逆 $\dot{Y}$ 阵. 以 $\dot{Y}$ 阵 A 可逆, K
有 $a_1 a_2 \cdots a_n \neq 0$. 以 $\dot{Y}$ 阵 A 可逆的充要条件是 $a_1 a_2 \cdots a_n \neq 0$.

2.(2)证



习题1.3($P_{36} - P_{38}$)

阵A不可能是可逆阵. 以阵A可逆, K

有 $a_1 a_2 \cdots a_n \neq 0$. 以阵A可逆的充要条件是 $a_1 a_2 \cdots a_n \neq 0$.

(2)证 设 $a_1 a_2 \cdots a_n \neq 0$, 由阵的乘法直 可以验证

$$\begin{pmatrix} 0 & \cdots & 0 & a_1 & 0 & \cdots & 0 & \frac{1}{a_n} \\ 0 & \cdots & a_2 & 0 & 0 & \cdots & \frac{1}{a_{n-1}} & 0 \\ \vdots & & \vdots & \vdots & \vdots & & \vdots & \vdots \\ a_n & \cdots & 0 & 0 & \frac{1}{a_1} & \cdots & 0 & 0 \end{pmatrix} \begin{pmatrix} 1 & 0 & \cdots & 0 \\ 0 & 1 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & 1 \end{pmatrix} = \begin{pmatrix} 1 & 0 & \cdots & 0 \\ 0 & 1 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & 1 \end{pmatrix}$$



习题1.3($P_{36} - P_{38}$)

阵A不可能是可逆Y阵. 以Y阵A可逆, K

有 $a_1 a_2 \cdots a_n \neq 0$. 以 $\dot{Y}$ 阵 A 可逆的充要条件是 $a_1 a_2 \cdots a_n \neq 0$.

2(2)证 设 $a_1 a_2 \cdots a_n \neq 0$, 由 Y 阵的乘法直 可以验证

$$\begin{pmatrix} 0 & \cdots & 0 & a_1 & 0 & \cdots & 0 & \frac{1}{a_n} \\ 0 & \cdots & a_2 & 0 & 0 & \cdots & \frac{1}{a_{n-1}} & 0 \\ \vdots & & \vdots & \vdots & \vdots & & \vdots & \vdots \\ a_n & \cdots & 0 & 0 & \frac{1}{a_1} & \cdots & 0 & 0 \end{pmatrix}
=
\begin{pmatrix} 0 & \cdots & 0 & \frac{1}{a_n} & 1 & 0 & 0 & a_1 \\ 0 & \cdots & \frac{1}{a_{n-1}} & 0 & 0 & \cdots & 0 & a_2 \\ \vdots & & \vdots & \vdots & \vdots & & \vdots & \vdots \\ \frac{1}{a_1} & \cdots & 0 & 0 & a_n & \cdots & 0 & 0 \end{pmatrix}$$



习题1.3($P_{36} - P_{38}$)

阵A不可能是可逆阵. 以阵A可逆, K

有 $a_1 a_2 \cdots a_n \neq 0$. 以阵A可逆的充要条件是 $a_1 a_2 \cdots a_n \neq 0$.

(2)证 设 $a_1 a_2 \cdots a_n \neq 0$, 由阵的乘法直 可以验证

$$\begin{pmatrix} 0 & \cdots & 0 & a_1 & 0 & \cdots & 0 \\ 0 & \cdots & a_2 & 0 & 0 & \cdots & \frac{1}{a_{n-1}} \\ \vdots & & \vdots & \vdots & \vdots & & \vdots \\ a_n & \cdots & 0 & 0 & \frac{1}{a_1} & \cdots & 0 \end{pmatrix} \begin{pmatrix} 1 & 0 & \cdots & 0 \\ 0 & \cdots & a_1 & 0 \\ 0 & \cdots & a_2 & 0 \\ \vdots & & \vdots & \vdots \\ 0 & \cdots & 1 & 0 \end{pmatrix} = \begin{pmatrix} 1 & 0 & \cdots & 0 \\ 0 & \cdots & 1 & 0 \\ 0 & \cdots & 0 & 1 \\ \vdots & & \vdots & \vdots \\ 0 & \cdots & 0 & 1 \end{pmatrix}$$



习题1.3($P_{36} - P_{38}$)

阵 A 不可能是可逆阵. 以阵 A 可逆, K

有 $a_1 a_2 \cdots a_n \neq 0$. 以阵 A 可逆的充要条件是 $a_1 a_2 \cdots a_n \neq 0$.

(2) 证 设 $a_1 a_2 \cdots a_n \neq 0$, 由阵的乘法直 可以验证

$$\begin{pmatrix} 0 & \cdots & 0 & a_1 & 0 & \cdots & 0 \\ 0 & \cdots & a_2 & 0 & 0 & \cdots & \frac{1}{a_{n-1}} \\ \vdots & & \vdots & \vdots & \vdots & & \vdots \\ a_n & \cdots & 0 & 0 & \frac{1}{a_1} & \cdots & 0 \end{pmatrix} \begin{pmatrix} 1 & 0 & \cdots & 0 \\ 0 & \cdots & a_1 & 0 \\ 0 & \cdots & a_2 & 0 \\ \vdots & & \vdots & \vdots \\ 0 & \cdots & 0 & a_n \end{pmatrix} = \begin{pmatrix} 1 & 0 & \cdots & 0 \\ 0 & \cdots & 1 & 0 \\ 0 & \cdots & 0 & 1 \\ \vdots & & \vdots & \vdots \\ 0 & \cdots & 0 & 1 \end{pmatrix}$$

以阵 A 可逆, 且其逆为 给定的阵.



习题1.3($P_{36} - P_{38}$)

若 $a_1 a_2 \cdots a_n = 0$, $\exists a_k = 0$, $\forall$ 阵 A 的第 k 行全为 0, $\forall$ 时对任意的 n 方阵 B ,



习题1.3($P_{36} - P_{38}$)

若 $a_1 a_2 \cdots a_n = 0$, $\exists a_k = 0$, $\forall$ 阵 A 的第 k 行全为0, $\forall$ 时对任意的 n 方阵 B , 由 $\forall$ 阵的乘法, $\exists$ 阵 AB 的第 k 行也是0,



习题1.3($P_{36} - P_{38}$)

若 $a_1 a_2 \cdots a_n = 0$, 且存在 $a_k = 0$, 则矩阵 A 的第 k 行全为0, 此时对任意的 n 方阵 B , 由矩阵的乘法, 则矩阵 AB 的第 k 行也是0, 即对任意矩阵 B , 都有矩阵 AB 不是单位矩阵, 此时矩阵 A 不可能是可逆矩阵.



习题1.3($P_{36} - P_{38}$)

若 $a_1 a_2 \cdots a_n = 0$, 则存在 $a_k = 0$, 则 n 阶方阵 A 的第 k 行全为 0, 此时对任意的 n 阶方阵 B , 由 n 阶方阵的乘法, 则 n 阶方阵 AB 的第 k 行也是 0, 即对任意 n 阶方阵 B , 都有 n 阶方阵 AB 不是单位 n 阶方阵, 此时 n 阶方阵 A 不可能是可逆 n 阶方阵. 以 n 阶方阵 A 可逆, 则有 $a_1 a_2 \cdots a_n \neq 0$.





习题1.3($P_{36} - P_{38}$)

若 $a_1 a_2 \cdots a_n = 0$, 则存在 $a_k = 0$, 则 n 阶方阵 A 的第 k 行全为 0, 此时对任意的 n 阶方阵 B , 由 n 阶方阵的乘法, 则 n 阶方阵 AB 的第 k 行也是 0, 即对任意 n 阶方阵 B , 都有 n 阶方阵 AB 不是单位 n 阶方阵, 此时 n 阶方阵 A 不可能是可逆 n 阶方阵. 以 n 阶方阵 A 可逆, 则有 $a_1 a_2 \cdots a_n \neq 0$. 以 n 阶方阵 A 可逆的充要条件是 $a_1 a_2 \cdots a_n \neq 0$.

2.(3)



习题1.3($P_{36} - P_{38}$)

若 $a_1 a_2 \cdots a_n = 0$, 则存在 $a_k = 0$, 则 n 阶方阵 A 的第 k 行全为0, 此时对任意的 n 阶方阵 B , 由 n 阶方阵的乘法, 则 n 阶方阵 AB 的第 k 行也是0, 即对任意 n 阶方阵 B , 都有 n 阶方阵 AB 不是单位 n 阶方阵, 此时 n 阶方阵 A 不可能是可逆 n 阶方阵. 以 n 阶方阵 A 可逆, 则有 $a_1 a_2 \cdots a_n \neq 0$. 以 n 阶方阵 A 可逆的充要条件是 $a_1 a_2 \cdots a_n \neq 0$.

$$\begin{pmatrix} 0 & 2 & 0 & 0 \\ 0 & 5 & 0 & 0 \\ 0 & 0 & 6 & 0 \end{pmatrix}^{-1} = \begin{pmatrix} 0 & \frac{1}{2} & 0 & 0 \\ 0 & \frac{1}{5} & 0 & 0 \\ 0 & 0 & \frac{1}{6} & 0 \end{pmatrix}$$



习题1.3($P_{36} - P_{38}$)

若 $a_1 a_2 \cdots a_n = 0$, 且 $a_k = 0$, 则矩阵 A 的第 k 行全为0, 从而对任意的 n 方阵 B , 由矩阵的乘法, 矩阵 AB 的第 k 行也是0, 即对任意矩阵 B , 都有矩阵 AB 不是单位矩阵, 从而 $\square \quad \square$



习题1.3($P_{36} - P_{38}$)

若 $a_1 a_2 \cdots a_n = 0$, 则存在 $a_k = 0$, 则矩阵 A 的第 k 行全为0, 从而对任意的 n 方阵 B , 由矩阵的乘法, 则矩阵 AB 的第 k 行也是0, 即对任意矩阵 B , 都有矩阵 AB 不是单位矩阵, 从而矩阵 A 不可能是可逆矩阵. 以矩阵 A 可逆, 则有 $a_1 a_2 \cdots a_n \neq 0$. 以矩阵 A 可逆的充要条件是 $a_1 a_2 \cdots a_n \neq 0$.

$$\begin{pmatrix} 0 & 2 & 0 & 0 \\ 0 & 5 & 0 & 0 \\ 0 & 0 & 6 & 0 \end{pmatrix} \xrightarrow{2.(3)} \begin{pmatrix} 0 & \frac{1}{2} & 0 & 0 \\ 0 & \frac{1}{5} & 0 & 0 \\ 0 & 0 & \frac{1}{6} & 0 \end{pmatrix} \xrightarrow{1. \times 2, 2. \times 5, 3. \times 6} \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix}$$



习题1.3($P_{36} - P_{38}$)

3.



习题1.3($P_{36} - P_{38}$)

3.证



习题1.3($P_{36} - P_{38}$)

3.证 若 $ab \neq 0$, 由 $\dot{Y}$ 阵的乘法, 直 验证:



习题1.3($P_{36} - P_{38}$)

3.证 若 $ab \neq 0$, 由 $\dot{Y}$ 阵的乘法, 直 验证:

$$\begin{pmatrix} a & c \\ 0 & b \end{pmatrix} \begin{pmatrix} \frac{1}{a} & -\frac{c}{ab} \\ 0 & \frac{1}{b} \end{pmatrix} =$$



习题1.3($P_{36} - P_{38}$)

3. 证 若 $ab \neq 0$, 由 $\dot{Y}$ 阵的乘法, 直接验证:

$$\begin{pmatrix} a & c \\ 0 & b \end{pmatrix} \begin{pmatrix} \frac{1}{a} & -\frac{c}{ab} \\ 0 & \frac{1}{b} \end{pmatrix} = \begin{pmatrix} \frac{1}{a} & -\frac{c}{ab} \\ 0 & \frac{1}{b} \end{pmatrix} \begin{pmatrix} a & c \\ 0 & b \end{pmatrix} =$$



习题1.3($P_{36} - P_{38}$)

3. 证 若 $ab \neq 0$, 由 $\dot{Y}$ 阵的乘法, 直接验证:

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习题1.3($P_{36} - P_{38}$)

3. 证 若 $ab \neq 0$, 由 $\hat{Y}$ 阵的乘法, 直接验证:

$$\begin{pmatrix} a & c \\ 0 & b \end{pmatrix} \begin{pmatrix} \frac{1}{a} & -\frac{c}{ab} \\ 0 & \frac{1}{b} \end{pmatrix} = \begin{pmatrix} \frac{1}{a} & -\frac{c}{ab} \\ 0 & \frac{1}{b} \end{pmatrix} \begin{pmatrix} a & c \\ 0 & b \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$$

以 $\hat{Y}$ 阵 A 可逆, 且其逆 $\hat{Y}$ 阵是 给定 $\hat{Y}$ 阵.



习题1.3($P_{36} - P_{38}$)

3. 证 若 $ab \neq 0$, 由 $\mathcal{Y}$ 阵的乘法, 直接验证:

$$\begin{pmatrix} a & c \\ 0 & b \end{pmatrix} \begin{pmatrix} \frac{1}{a} & -\frac{c}{ab} \\ 0 & \frac{1}{b} \end{pmatrix} = \begin{pmatrix} \frac{1}{a} & -\frac{c}{ab} \\ 0 & \frac{1}{b} \end{pmatrix} \begin{pmatrix} a & c \\ 0 & b \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$$

以 $\mathcal{Y}$ 阵 A 可逆, 且其逆 $\mathcal{Y}$ 阵是 给定 $\mathcal{Y}$ 阵.

若 $a = 0$, 令 $\mathcal{Y}$ 阵 A 的第一列为 0, 从而对任意的 2×2 $\mathcal{Y}$ 阵 B , 都有 BA 的第一列全为 0, 从而对任意的 2×2 $\mathcal{Y}$ 阵 B , 都有 BA 不是单位 $\mathcal{Y}$ 阵, 所以 A 不可逆;



习题1.3($P_{36} - P_{38}$)

3. 证 若 $ab \neq 0$, 由 $\hat{Y}$ 阵的乘法, 直接验证:

$$\begin{pmatrix} a & c \\ 0 & b \end{pmatrix} \begin{pmatrix} \frac{1}{a} & -\frac{c}{ab} \\ 0 & \frac{1}{b} \end{pmatrix} = \begin{pmatrix} \frac{1}{a} & -\frac{c}{ab} \\ 0 & \frac{1}{b} \end{pmatrix} \begin{pmatrix} a & c \\ 0 & b \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$$

以 $\hat{Y}$ 阵 A 可逆, 且其逆 $\hat{Y}$ 阵是 给定 $\hat{Y}$ 阵.

若 $a = 0$, $\hat{Y}$ 阵 A 的第一列为 0, 从而对任意的 2×2 $\hat{Y}$ 阵 B , 都有 BA 的第一列全为 0, 从而对任意的 2×2 $\hat{Y}$ 阵 B , 都有 BA 不是单位 $\hat{Y}$ 阵, 以 A 不可逆;

若 $b = 0$, $\hat{Y}$ 阵 A 的第二行为 0, 从而对任意的 2×2 $\hat{Y}$ 阵 B , 都有 AB 的第二行全为 0, 从而对任意的 2×2 $\hat{Y}$ 阵 B , 都有 AB 不是单位 $\hat{Y}$ 阵, 以 A 不可逆;



习题1.3($P_{36} - P_{38}$)

3. 证 若 $ab \neq 0$, 由 $\dot{Y}$ 阵的乘法, 直接验证:

$$\begin{pmatrix} a & c \\ 0 & b \end{pmatrix} \begin{pmatrix} \frac{1}{a} & -\frac{c}{ab} \\ 0 & \frac{1}{b} \end{pmatrix} = \begin{pmatrix} \frac{1}{a} & -\frac{c}{ab} \\ 0 & \frac{1}{b} \end{pmatrix} \begin{pmatrix} a & c \\ 0 & b \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$$

以 $\dot{Y}$ 阵 A 可逆, 且其逆 $\dot{Y}$ 阵是 给定 $\dot{Y}$ 阵.

若 $a = 0$, $\dot{Y}$ 阵 A 的第一列为 0, 从而对任意的 $2 \times 2 \dot{Y}$ 阵 B , 都有 BA 的第一列全为 0, 从而对任意的 $2 \times 2 \dot{Y}$ 阵 B , 都有 BA 不是单位 $\dot{Y}$ 阵, 以 A 不可逆;

若 $b = 0$, $\dot{Y}$ 阵 A 的第二行为 0, 从而对任意的 $2 \times 2 \dot{Y}$ 阵 B , 都有 AB 的第二行全为 0, 从而对任意的 $2 \times 2 \dot{Y}$ 阵 B , 都有 AB 不是单位 $\dot{Y}$ 阵, 以 A 不可逆;

从而 $ab = 0$ 时, A 不是可逆 $\dot{Y}$ 阵, 即, A 可逆, $\Leftrightarrow ab \neq 0$.



习题1.3($P_{36} - P_{38}$)

3. 证 若 $ab \neq 0$, 由 $\dot{Y}$ 阵的乘法, 直接验证:

$$\begin{pmatrix} a & c \\ 0 & b \end{pmatrix} \begin{pmatrix} \frac{1}{a} & -\frac{c}{ab} \\ 0 & \frac{1}{b} \end{pmatrix} = \begin{pmatrix} \frac{1}{a} & -\frac{c}{ab} \\ 0 & \frac{1}{b} \end{pmatrix} \begin{pmatrix} a & c \\ 0 & b \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$$

以 $\dot{Y}$ 阵 A 可逆, 且其逆 $\dot{Y}$ 阵是 给定 $\dot{Y}$ 阵.

若 $a = 0$, $\dot{Y}$ 阵 A 的第一列为 0, 从而对任意的 $2 \times 2 \dot{Y}$ 阵 B , 都有 BA 的第一列全为 0, 从而对任意的 $2 \times 2 \dot{Y}$ 阵 B , 都有 BA 不是单位 $\dot{Y}$ 阵, 以 A 不可逆;

若 $b = 0$, $\dot{Y}$ 阵 A 的第二行为 0, 从而对任意的 $2 \times 2 \dot{Y}$ 阵 B , 都有 AB 的第二行全为 0, 从而对任意的 $2 \times 2 \dot{Y}$ 阵 B , 都有 AB 不是单位 $\dot{Y}$ 阵, 以 A 不可逆;

从而 $ab = 0$ 时, A 不是可逆 $\dot{Y}$ 阵, 即, A 可逆, $\Leftrightarrow ab \neq 0$.

以, A 可逆的充要条件是 $ab \neq 0$



习题1.3($P_{36} - P_{38}$)

4.(1)



习题1.3($P_{36} - P_{38}$)

4.(1)证 记 $AB = C$; $BA = D$.



习题1.3($P_{36} - P_{38}$)

4.(1)证 记 $AB = C$; $BA = D$. 假设 C ; D 都是可逆阵,



习题1.3($P_{36} - P_{38}$)

4.(1)证 记 $AB = C$; $BA = D$. 假设 C ; D 都是可逆阵,
 因为 $AB = C$ 且 A 是可逆阵, 3 $AB = C$ 边同时左
 乘 A^{-1} , 得 $A^{-1}(AB) = A^{-1}C$, 即 $B = A^{-1}C$.



习题1.3($P_{36} - P_{38}$)

4.(1)证 记 $AB = C$; $BA = D$. 假设 C ; D 都是可逆阵,
 因为 $AB = C$ 且 A 是可逆阵, 3 $AB = C$ 两边同时左
 乘 A^{-1} , 得 $A^{-1}(AB) = A^{-1}C$, 即 $B = A^{-1}C$.
 可逆阵之积仍是可逆阵, 以 $B = A^{-1}C$ 为可逆阵,
 与 B 不可逆 盾.



习题1.3($P_{36} - P_{38}$)

4.(1)证 记 $AB = C$; $BA = D$. 假设 C ; D 都是可逆阵,
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 可逆阵之积仍是可逆阵, 以 $B = A^{-1}C$ 为可逆阵,
 与 B 不可逆 盾. 以 AB 不可逆.



习题1.3($P_{36} - P_{38}$)

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 可逆阵之积仍是可逆阵, 以 $B = A^{-1}C$ 为可逆阵,
 与 B 不可逆 盾. 以 AB 不可逆.
 因为 $BA = D$ 且 A 是可逆阵, 3 $BA = D$ 两边同时右
 乘 A^{-1} , 得 $(BA)A^{-1} = DA^{-1}$, 即 $B = DA^{-1}$.



习题1.3($P_{36} - P_{38}$)

- 4.(1)证 记 $AB = C$; $BA = D$. 假设 C ; D 都是可逆阵,
 因为 $AB = C$ 且 A 是可逆阵, 3 $AB = C$ 边同时左
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 与 B 不可逆 盾. 以 AB 不可逆.
 因为 $BA = D$ 且 A 是可逆阵, 3 $BA = D$ 边同时右
 乘 A^{-1} , 得 $(BA)A^{-1} = DA^{-1}$, 即 $B = DA^{-1}$.
 可逆阵之积仍是可逆阵, 以 $B = DA^{-1}$ 为可逆阵,
 与 B 不可逆 盾.



习题1.3($P_{36} - P_{38}$)

4.(1)证 记 $AB = C$; $BA = D$. 假设 C ; D 都是可逆阵,
因为 $AB = C$ 且 A 是可逆阵, 3 $AB = C$ 边同时左
乘 A^{-1} , 得 $A^{-1}(AB) = A^{-1}C$, 即 $B = A^{-1}C$.

可逆阵之积仍是可逆阵, 以 $B = A^{-1}C$ 为可逆阵,
与 B 不可逆 盾. 以 AB 不可逆.

因为 $BA = D$ 且 A 是可逆阵, 3 $BA = D$ 边同时右
乘 A^{-1} , 得 $(BA)A^{-1} = DA^{-1}$, 即 $B = DA^{-1}$.

可逆阵之积仍是可逆阵, 以 $B = DA^{-1}$ 为可逆阵,
与 B 不可逆 盾. 以 BA 不可逆.

4.(2)



习题1.3($P_{36} - P_{38}$)

4.(1)证 记 $AB = C$; $BA = D$. 假设 C ; D 都是可逆 $\dot{Y}$ 阵,
因为 $AB = C$ 且 A 是可逆 $\dot{Y}$ 阵, 3 $AB = C$ 边同时左
乘 A^{-1} , 得 $A^{-1}(AB) = A^{-1}C$, 即 $B = A^{-1}C$.

可逆 $\dot{Y}$ 阵之积仍是可逆 $\dot{Y}$ 阵, 以 $B = A^{-1}C$ 为可逆 $\dot{Y}$ 阵,
与 B 不可逆 盾. 以 AB 不可逆.

因为 $BA = D$ 且 A 是可逆 $\dot{Y}$ 阵, 3 $BA = D$ 边同时右
乘 A^{-1} , 得 $(BA)A^{-1} = DA^{-1}$, 即 $B = DA^{-1}$.

可逆 $\dot{Y}$ 阵之积仍是可逆 $\dot{Y}$ 阵, 以 $B = DA^{-1}$ 为可逆 $\dot{Y}$ 阵,
与 B 不可逆 盾. 以 BA 不可逆.

4.(2)证 因为 A ; AB 都是可逆 $\dot{Y}$ 阵, 以 $A^{-1}(AB)$ 是可逆 $\dot{Y}$ 阵,



习题1.3($P_{36} - P_{38}$)

4.(1)证 记 $AB = C$; $BA = D$. 假设 C ; D 都是可逆 $\dot{Y}$ 阵,
因为 $AB = C$ 且 A 是可逆 $\dot{Y}$ 阵, 3 $AB = C$ 边同时左
乘 A^{-1} , 得 $A^{-1}(AB) = A^{-1}C$, 即 $B = A^{-1}C$.

可逆 $\dot{Y}$ 阵之积仍是可逆 $\dot{Y}$ 阵, 以 $B = A^{-1}C$ 为可逆 $\dot{Y}$ 阵,
与 B 不可逆 盾. 以 AB 不可逆.

因为 $BA = D$ 且 A 是可逆 $\dot{Y}$ 阵, 3 $BA = D$ 边同时右
乘 A^{-1} , 得 $(BA)A^{-1} = DA^{-1}$, 即 $B = DA^{-1}$.

可逆 $\dot{Y}$ 阵之积仍是可逆 $\dot{Y}$ 阵, 以 $B = DA^{-1}$ 为可逆 $\dot{Y}$ 阵,
与 B 不可逆 盾. 以 BA 不可逆.

4.(2)证 因为 A ; AB 都是可逆 $\dot{Y}$ 阵, 以 $A^{-1}(AB)$ 是可逆
 $\dot{Y}$ 阵, 即 $B = A^{-1}(AB)$ 是可逆 $\dot{Y}$ 阵.



习题1.3($P_{36} - P_{38}$)

4.(3)



习题1.3($P_{36} - P_{38}$)

4.(3)证 假设 A 规范 梯形 $\dot{Y}$ 阵中 有0行,



习题1.3($P_{36} - P_{38}$)

4.(3)证 假设 A 规范 梯形 $\dot{Y}$ 阵中 有0行, 由于 A 是
 $n \times n$ $\dot{Y}$ 阵, 以 $\dot{Y}$ 阵 A 的规范 梯形 $\dot{Y}$ 阵中, 一行都有一个
 主 , 且主 应该分布 3 一列,



习题1.3($P_{36} - P_{38}$)

4.(3)证 假设 A 规范 梯形 $\dot{Y}$ 阵中 有0行, 由于 A 是
 $n \times n$ $\dot{Y}$ 阵, 以 $\dot{Y}$ 阵 A 的规范 梯形 $\dot{Y}$ 阵中, 一行都有一个
 主 , 且主 应该分布 3 一列, 从而 A 的规范 梯形只能是单
 位 $\dot{Y}$ 阵,

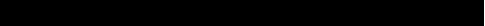


习题1.3($P_{36} - P_{38}$)

4.(3)证 假设 A 规范 梯形 $\dot{Y}$ 阵中 有0行, 由于 A 是
 $n \times n \dot{Y}$ 阵, 以 $\dot{Y}$ 阵 A 的规范 梯形 $\dot{Y}$ 阵中, 一行都有一个
 主 , 且主 应该分布 3 一列, 从而 A 的规范 梯形只能是单
 位 $\dot{Y}$ 阵, 即存 3 初等 $\dot{Y}$ 阵 $P_1; P_2; \dots; P_s$, 使得

$$P_s \cdots P_2 P_1 A = I;$$





习题1.3($P_{36} - P_{38}$)

4.(3)证 假设 A 规范 梯形 $\dot{Y}$ 阵中 有0行, 由于 A 是
 $n \times n \dot{Y}$ 阵, 以 $\dot{Y}$ 阵 A 的规范 梯形 $\dot{Y}$ 阵中, 一行都有一个
 主 , 且主 应该分布 3 一列, 从而 A 的规范 梯形只能是单
 位 $\dot{Y}$ 阵, $\square$



习题1.3($P_{36} - P_{38}$)

4.(3)证 假设 A 规范 梯形 $\dot{Y}$ 阵中 有0行, 由于 A 是
 $n \times n$ $\dot{Y}$ 阵, 以 $\dot{Y}$ 阵 A 的规范 梯形 $\dot{Y}$ 阵中, 一行都有一个
 主 , 且主 应该分布 3 一列, 从而 A 的规范 梯形只能是单
 位 $\dot{Y}$ 阵, 即存 3 初等 $\dot{Y}$ 阵 $P_1; P_2; \dots; P_s$, 使得

$$P_s \cdots P_2 P_1 A = I; A = P_1^{-1} P_2^{-1} \cdots P_s^{-1}$$

为可逆 $\dot{Y}$ 阵之积, 为可逆 $\dot{Y}$ 阵, 与已知 盾.

以不可逆方阵的规范 梯形中, 必有0行.

4.(4)



习题1.3($P_{36} - P_{38}$)

4.(3)证 假设 A 规范 梯形 $\dot{Y}$ 阵中 有0行, 由于 A 是
 $n \times n \dot{Y}$ 阵, 以 $\dot{Y}$ 阵 A 的规范 梯形 $\dot{Y}$ 阵中, 一行都有一个
 主 , 且主 应该分布 3 一列, 从而 A 的规范 梯形只能是单
 位 $\dot{Y}$ 阵, 即存 3 初等 $\dot{Y}$ 阵 $P_1; P_2; \dots; P_s$, 使得

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为可逆 $\dot{Y}$ 阵之积, 为可逆 $\dot{Y}$ 阵, 与已知 盾.

以不可逆方阵的规范 梯形中, 必有0行.

4.(4)证 若 $A; B$ 都可逆, 而可逆 $\dot{Y}$ 阵之积仍可逆, 从
 而 AB 可逆.

设 AB 可逆, 若 A 不可逆, 由4.(3)的 (论, KA 的规范
 梯形中必有0行,



习题1.3($P_{36} - P_{38}$)

4.(3)证 假设 A 规范 梯形 $\dot{Y}$ 阵中 有0行, 由于 A 是
 $n \times n \dot{Y}$ 阵, 以 $\dot{Y}$ 阵 A 的规范 梯形 $\dot{Y}$ 阵中, 一行都有一个
 主 , 且主 应该分布 3 一列, 从而 A 的规范 梯形只能是单
 位 $\dot{Y}$ 阵, 即存 3 初等 $\dot{Y}$ 阵 $P_1; P_2; \dots; P_s$, 使得

$$P_s \cdots P_2 P_1 A = I; A = P_1^{-1} P_2^{-1} \cdots P_s^{-1}$$

为可逆 $\dot{Y}$ 阵之积, 为可逆 $\dot{Y}$ 阵, 与已知 盾.

以不可逆方阵的规范 梯形中, 必有0行.

4.(4)证 若 $A; B$ 都可逆, 而可逆 $\dot{Y}$ 阵之积仍可逆, 从
 而 AB 可逆.

设 AB 可逆, 若 A 不可逆, 由4.(3)的 (论, KA 的规范
 梯形中必有0行, 设 A 的规范 梯形为 C , 从而存 3 初等 $\dot{Y}$
 阵 $P_1; P_2; \dots; P_s$, 使得 $P_s \cdots P_2 P_1 A = C$,



习题1.3($P_{36} - P_{38}$)

4.(3)证 假设 A 规范 梯形 $\dot{Y}$ 阵中 有0行, 由于 A 是
 $n \times n$ $\dot{Y}$ 阵, 以 $\dot{Y}$ 阵 A 的规范 梯形 $\dot{Y}$ 阵中, 一行都有一个
 主 , 且主 应该分布 3 一列, 从而 A 的规范 梯形只能是单
 位 $\dot{Y}$ 阵,



习题1.3($P_{36} - P_{38}$)

2 由4.(1)的 (论, $AB = (P_1^{-1}P_2^{-1} \cdots P_s^{-1})(BC)$ 不可逆, 与
已知 盾.



习题1.3($P_{36} - P_{38}$)

2 由4.(1)的 (论, $AB = (P_1^{-1}P_2^{-1} \cdots P_s^{-1})(BC)$ 不可逆, 与已知 盾.

若 A 可逆而 B 不可逆,



习题1.3($P_{36} - P_{38}$)

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若 A 可逆而 B 不可逆, 由4.(1)的 (论, KAB 不可逆, 与已知 盾.



习题1.3($P_{36} - P_{38}$)

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0 5.) | 用 $\dot{Y}$ 阵的乘法, 方程组可以表示为

$$\begin{matrix} 0 & 1 \\ x_1 & 1 \\ A & B \\ @ & C \\ x_2 & A \\ x_3 & 3 \end{matrix} = \begin{matrix} 1 \\ 2 \\ 2 \\ 3 \end{matrix} \begin{matrix} 1 \\ 1 \\ 2 \\ 3 \end{matrix}$$



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$$\begin{pmatrix} 0 & 1 & 3 \\ 1 & 0 & 0 \\ 0 & 1 & 1 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = A^{-1} \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix} = \begin{pmatrix} 1 & 0 & 1 \\ 1 & 1 & 1 \\ 0 & 1 & 1 \end{pmatrix} \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}$$



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[illegible]



习题1.3($P_{36} - P_{38}$)

6.



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习题1.3($P_{36} - P_{38}$)

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9.) 因为 $AB = 2A + B$, 以 $AB - B - 2A + 2I = 2I$,



习题1.3($P_{36} - P_{38}$)

9.) 因为 $AB = 2A + B$, 以 $AB - B - 2A + 2I = 2I$,
以 $(A - I)(B - 2I) = 2I$;



习题1.3($P_{36} - P_{38}$)

- 9.) 因为 $AB = 2A + B$, 以 $AB - B - 2A + 2I = 2I$,
以 $(A - I)(B - 2I) = 2I$; $(B - 2I)^{-1}(A - I)^{-1} = (2I)^{-1}$,



习题1.3($P_{36} - P_{38}$)

9.) 因为 $AB = 2A + B$, 以 $AB - B - 2A + 2I = 2I$,
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习题1.3($P_{36} - P_{38}$)

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$$(A - I)^{-1} = (B - 2I)(2I)^{-1}$$

$$\text{又因为 } B - 2I = \begin{pmatrix} 0 & 0 & 2 \\ 0 & 2 & 0 \\ 2 & 0 & 0 \end{pmatrix} \begin{matrix} B \\ C \\ A \end{matrix};$$



习题1.3($P_{36} - P_{38}$)

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 $(A - I)^{-1} = (B - 2I)(2I)^{-1}$

又因为 $B - 2I = \begin{pmatrix} 0 & 0 & 2 \\ 0 & 2 & 0 \\ 2 & 0 & 0 \end{pmatrix} = \begin{pmatrix} B & & C \\ @ & & A \end{pmatrix}$; $(2I)^{-1} = \frac{1}{2}I$



习题1.3($P_{36} - P_{38}$)

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又因为 $B - 2I = \begin{pmatrix} 0 & 0 & 2 \\ 0 & 2 & 0 \\ 0 & 0 & 0 \end{pmatrix}$; $(2I)^{-1} = \frac{1}{2}I$

以 $(A - I)^{-1} = \begin{pmatrix} 0 & 0 & 1 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{pmatrix}$.



习题1.3($P_{36} - P_{38}$)

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又因为 $B - 2I = \begin{pmatrix} 0 & 0 & 2 \\ 0 & 2 & 0 \\ 0 & 0 & 0 \end{pmatrix}$; $(2I)^{-1} = \frac{1}{2}I$

以 $(A - I)^{-1} = \begin{pmatrix} 0 & 0 & 1 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{pmatrix}$.

10.



习题1.3($P_{36} - P_{38}$)

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 以 $(A - I)(B - 2I) = 2I$; $(B - 2I)^{-1}(A - I)^{-1} = (2I)^{-1}$,
 $(A - I)^{-1} = (B - 2I)(2I)^{-1}$

又因为 $B - 2I = \begin{pmatrix} 0 & 0 & 2 \\ 0 & 2 & 0 \\ 0 & 0 & 1 \end{pmatrix}$; $(2I)^{-1} = \frac{1}{2}I$

以 $(A - I)^{-1} = \begin{pmatrix} 2 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{pmatrix} \begin{pmatrix} B \\ C \\ A \end{pmatrix}$.

10.) ~ 如 $A = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$; $B = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$,



习题1.3($P_{36} - P_{38}$)

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又因为 $B - 2I = \begin{pmatrix} 0 & 0 & 2 \\ 0 & 2 & 0 \\ 0 & 0 & 1 \end{pmatrix}$; $(2I)^{-1} = \frac{1}{2}I$

以 $(A - I)^{-1} = \begin{pmatrix} 0 & 0 & 1 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{pmatrix}$.

10.) ~ 如 $A = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$; $B = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$,

A, B 都是可逆阵, 且 $A^{-1} = A; B^{-1} = B$,



习题1.3($P_{36} - P_{38}$)

$$A + B = \begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}, \text{ 规范 梯形为 } \begin{pmatrix} 1 & 1 \\ 0 & 0 \end{pmatrix},$$



习题1.3($P_{36} - P_{38}$)

$$A + B = \begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}, \text{ 规范 梯形为 } \begin{pmatrix} 1 & 1 \\ 0 & 0 \end{pmatrix}, A + B \text{ 不可逆.}$$



习题1.3($P_{36} - P_{38}$)

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11.



习题1.3($P_{36} - P_{38}$)

$A + B = \begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}$, 规范 梯形为 $\begin{pmatrix} 1 & 1 \\ 0 & 0 \end{pmatrix}$, $A + B$ 不可逆.

11. 证 若 $A + B$ 可逆, $K A^{-1}(A + B)B^{-1}$ 可逆,



习题1.3($P_{36} - P_{38}$)

$A + B = \begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}$ ，规范 梯形为 $\begin{pmatrix} 1 & 1 \\ 0 & 0 \end{pmatrix}$ ， $A + B$ 不可逆。

11. 证 若 $A + B$ 可逆， $K A^{-1}(A + B)B^{-1}$ 可逆，
而 $A^{-1}(A + B)B^{-1} = A^{-1} + B^{-1}$ ，以 $A^{-1} + B^{-1}$ 可逆；



习题1.3($P_{36} - P_{38}$)

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 若 $A^{-1} + B^{-1}$ 可逆， $K A(A^{-1} + B^{-1})B$ 可逆，



习题1.3($P_{36} - P_{38}$)

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 若 $A^{-1} + B^{-1}$ 可逆, $K A(A^{-1} + B^{-1})B$ 可逆,
 而 $A(A^{-1} + B^{-1})B = A + B$ 可逆, 以 $A + B$ 可逆.



习题1.3($P_{36} - P_{38}$)

$A + B = \begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}$ ，规范 梯形为 $\begin{pmatrix} 1 & 1 \\ 0 & 0 \end{pmatrix}$ ， $A + B$ 不可逆。

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 $(A + B)^{-1} = [A(A^{-1} + B^{-1})B]^{-1} = B^{-1}(A^{-1} + B^{-1})^{-1}A^{-1}$



习题1.3($P_{36} - P_{38}$)

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 $(A + B)^{-1} = [A(A^{-1} + B^{-1})B]^{-1} = B^{-1}(A^{-1} + B^{-1})^{-1}A^{-1}$

12.



习题1.3($P_{36} - P_{38}$)

$A + B = \begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}$, 规范 梯形为 $\begin{pmatrix} 1 & 1 \\ 0 & 0 \end{pmatrix}$, $A + B$ 不可逆.

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 而 $A(A^{-1} + B^{-1})B = A + B$ 可逆, 以 $A + B$ 可逆.
 $(A + B)^{-1} = [A(A^{-1} + B^{-1})B]^{-1} = B^{-1}(A^{-1} + B^{-1})^{-1}A^{-1}$

12.) 因为 $P_1A = B$; $P_2B = I$,



习题1.3($P_{36} - P_{38}$)

$A + B = \begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}$, 规范 梯形为 $\begin{pmatrix} 1 & 1 \\ 0 & 0 \end{pmatrix}$, $A + B$ 不可逆.

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 $(A + B)^{-1} = [A(A^{-1} + B^{-1})B]^{-1} = B^{-1}(A^{-1} + B^{-1})^{-1}A^{-1}$

12.) 因为 $P_1A = B$; $P_2B = I$,

以 $(P_2P_1)A = I$,



习题1.3($P_{36} - P_{38}$)

$A + B = \begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}$, 规范 梯形为 $\begin{pmatrix} 1 & 1 \\ 0 & 0 \end{pmatrix}$, $A + B$ 不可逆.

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 若 $A^{-1} + B^{-1}$ 可逆, $K A(A^{-1} + B^{-1})B$ 可逆,
 而 $A(A^{-1} + B^{-1})B = A + B$ 可逆, 以 $A + B$ 可逆.
 $(A + B)^{-1} = [A(A^{-1} + B^{-1})B]^{-1} = B^{-1}(A^{-1} + B^{-1})^{-1}A^{-1}$

12.) 因为 $P_1A = B$; $P_2B = I$,

以 $(P_2P_1)A = I$, $A = (P_2P_1)^{-1} = P_1^{-1}P_2^{-1}$.



习题1.4($P_{39} - P_{41}$)

1.(1)



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccc}
 0 & & & 1 \\
 0 & -2 & 1 & \\
 3 & 0 & -2 & \\
 -2 & 3 & 0 &
 \end{array}
 \begin{array}{l}
 \\
 \text{换1、2行} \\
 \text{第3行加到第1行} \\
 \end{array}
 \rightarrow$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{ccccccc}
 & 0 & & 1 & & & 0 & & 1 \\
 & 0 & -2 & 1 & & & 1 & 3 & -2 \\
 1.(1) \quad \begin{pmatrix} B \\ @ \end{pmatrix} & 3 & 0 & -2 & \begin{pmatrix} C \\ A \end{pmatrix} & \longrightarrow & \begin{pmatrix} B \\ @ \end{pmatrix} & 0 & -2 & 1 & \begin{pmatrix} C \\ A \end{pmatrix} \\
 & -2 & 3 & 0 & & & -2 & 3 & 0
 \end{array}$$

换1、2行
第3行加到第1行



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{ccccccc}
 & 0 & & 1 & & & 0 & & 1 \\
 & 0 & -2 & 1 & & & 0 & 1 & 3 & -2 \\
 1.(1) \quad \begin{array}{c} B \\ @ \end{array} & 3 & 0 & -2 & \begin{array}{c} C \\ A \end{array} & \xrightarrow{\text{换1、2行}} & \begin{array}{c} B \\ @ \end{array} & 0 & -2 & 1 & \begin{array}{c} C \\ A \end{array} \\
 & -2 & 3 & 0 & & & -2 & 3 & 0
 \end{array}$$

第3行加到第1行

第1行的2倍加到第3行

→

第2行的4倍加到第3行



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{l}
 \begin{array}{cccc}
 0 & 1 & & \\
 0 & -2 & 1 & \\
 3 & 0 & -2 & \\
 -2 & 3 & 0 &
 \end{array}
 \begin{array}{l}
 \text{换1、2行} \\
 \text{第3行加到第1行} \\
 \text{第1行的2倍加到第3行} \\
 \text{第2行的4倍加到第3行}
 \end{array}
 \begin{array}{l}
 \text{B} \\
 \text{A} \\
 \text{C} \\
 \text{A}
 \end{array}
 \longrightarrow
 \begin{array}{cccc}
 0 & 1 & 3 & -2 \\
 0 & -2 & 1 & \\
 -2 & 3 & 0 &
 \end{array}
 \begin{array}{l}
 \text{B} \\
 \text{A} \\
 \text{C} \\
 \text{A}
 \end{array}
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{l}
 \begin{array}{cccc}
 0 & 1 & & \\
 0 & -2 & 1 & \\
 3 & 0 & -2 & \\
 -2 & 3 & 0 &
 \end{array}
 \begin{array}{l}
 \text{换1、2行} \\
 \text{第3行加到第1行} \\
 \text{第1行的2倍加到第3行} \\
 \text{第2行的4倍加到第3行}
 \end{array}
 \begin{array}{cccc}
 0 & 1 & 3 & -2 \\
 0 & -2 & 1 & \\
 -2 & 3 & 0 & \\
 0 & 1 & 3 & -2
 \end{array}
 \begin{array}{l}
 \text{换2、3行} \\
 \text{第2行的2倍加到第3行}
 \end{array}
 \end{array}
 \rightarrow
 \begin{array}{cccc}
 0 & 1 & 3 & -2 \\
 0 & -2 & 1 & \\
 -2 & 3 & 0 & \\
 0 & 1 & 0 &
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{l}
 \begin{array}{cccc}
 0 & 1 & & \\
 & 0 & -2 & 1 \\
 \text{B} & 3 & 0 & -2 \\
 \text{A} & & &
 \end{array}
 \xrightarrow{\text{换1、2行}}
 \begin{array}{cccc}
 0 & 1 & 3 & -2 \\
 \text{B} & 0 & -2 & 1 \\
 \text{A} & & &
 \end{array} \\
 \begin{array}{cccc}
 & -2 & 3 & 0 \\
 & 0 & 1 & 3 \\
 & 1 & 3 & -2 \\
 \text{B} & 0 & -2 & 1 \\
 \text{A} & & &
 \end{array}
 \xrightarrow{\begin{array}{l} \text{第3行加到第1行} \\ \text{第1行的2倍加到第3行} \end{array}}
 \begin{array}{cccc}
 & -2 & 3 & 0 \\
 & 0 & 1 & 0 \\
 & 0 & 1 & 0 \\
 \text{B} & 0 & -2 & 1 \\
 \text{A} & & &
 \end{array} \\
 \begin{array}{cccc}
 & 0 & 1 & 0 \\
 & 1 & 3 & -2 \\
 \text{B} & 0 & 1 & 0 \\
 \text{A} & & &
 \end{array}
 \xrightarrow{\begin{array}{l} \text{第2行的2倍加到第3行} \\ \text{第2行的4倍加到第3行} \end{array}}
 \begin{array}{ccc}
 0 & 1 & 3 \\
 \text{B} & 0 & 1 \\
 \text{A} & &
 \end{array} \\
 \begin{array}{ccc}
 0 & 0 & 1 \\
 0 & 1 & 0 \\
 0 & 0 & 1
 \end{array}
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{l}
 \begin{array}{cccc}
 0 & 1 & & \\
 0 & -2 & 1 & \\
 3 & 0 & -2 & \\
 -2 & 3 & 0 &
 \end{array}
 \begin{array}{l}
 \text{换1、2行} \\
 \text{第3行加到第1行} \\
 \text{第1行的2倍加到第3行} \\
 \text{第2行的4倍加到第3行} \\
 \text{第3行的2倍加到第1行}
 \end{array}
 \begin{array}{ccc}
 \text{B} & & \text{C} \\
 @ & & \text{A} \\
 & & \\
 & &
 \end{array}
 \longrightarrow
 \begin{array}{cccc}
 0 & 1 & 3 & -2 \\
 0 & -2 & 1 & \\
 -2 & 3 & 0 & \\
 0 & 1 & 3 & -2
 \end{array}
 \begin{array}{l}
 \text{换2、3行} \\
 \text{第2行的2倍加到第3行}
 \end{array}
 \begin{array}{ccc}
 \text{B} & & \text{C} \\
 @ & & \text{A} \\
 & & \\
 & &
 \end{array}
 \longrightarrow
 \begin{array}{ccc}
 0 & 1 & 0 \\
 1 & 0 & 0 \\
 0 & 1 & 0 \\
 0 & 0 & 1
 \end{array}
 \begin{array}{l}
 \text{第2行的(-3)倍加到第1行}
 \end{array}
 \begin{array}{ccc}
 \text{B} & & \text{C} \\
 @ & & \text{A} \\
 & & \\
 & &
 \end{array}
 \longrightarrow
 \begin{array}{ccc}
 0 & 1 & 0 \\
 1 & 0 & 0 \\
 0 & 0 & 1
 \end{array}
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{l}
 \begin{array}{cccc}
 0 & 1 & & \\
 0 & -2 & 1 & \\
 3 & 0 & -2 & \\
 -2 & 3 & 0 &
 \end{array}
 \begin{array}{l}
 \text{换1、2行} \\
 \text{第3行加到第1行} \\
 \text{第1行的2倍加到第3行} \\
 \text{第2行的4倍加到第3行} \\
 \text{第3行的2倍加到第1行}
 \end{array}
 \begin{array}{ccc}
 0 & 1 & \\
 0 & -2 & 1 \\
 0 & 1 & 0
 \end{array}
 \begin{array}{l}
 \text{换2、3行} \\
 \text{第2行的2倍加到第3行}
 \end{array}
 \begin{array}{ccc}
 0 & 1 & \\
 0 & 1 & 0 \\
 0 & 0 & 1
 \end{array}
 \end{array}
 \begin{array}{l}
 \text{对应的初等 } \gamma \text{ 阵分别是}
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$P_1 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix};$$



习题1.4($P_{39} - P_{41}$)

$$P_1 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}; P_2 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$



习题1.4($P_{39} - P_{41}$)

$$P_1 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}; P_2 = \begin{pmatrix} 0 & 1 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}; P_3 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 2 & 0 & 1 \end{pmatrix};$$



习题1

$$\begin{aligned}
 P_1 &= \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \end{pmatrix}; P_2 = \begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}; P_3 = \begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}; \\
 P_4 &= \begin{pmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 4 & 1 \end{pmatrix}
 \end{aligned}$$





习题1.4($P_{39} - P_{41}$)

$$\begin{aligned}
 P_1 &= \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}; P_2 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 1 \\ 0 & 0 & 1 \end{pmatrix}; P_3 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{pmatrix}; \\
 P_4 &= \begin{pmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{pmatrix}; P_5 = \begin{pmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}; P_6 = \begin{pmatrix} 2 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{pmatrix}; \\
 &\quad \begin{pmatrix} 0 & 4 & 1 \\ 0 & 1 & 0 \\ 0 & 2 & 1 \end{pmatrix}
 \end{aligned}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{aligned}
 P_1 &= \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}; P_2 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 1 \\ 0 & 0 & 1 \end{pmatrix}; P_3 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{pmatrix}; \\
 P_4 &= \begin{pmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{pmatrix}; P_5 = \begin{pmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}; P_6 = \begin{pmatrix} 2 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{pmatrix}; \\
 P_7 &= \begin{pmatrix} 0 & 4 & 1 \\ 1 & 0 & 2 \\ 0 & 1 & 0 \end{pmatrix};
 \end{aligned}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{aligned}
 P_1 &= \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \end{pmatrix} \begin{matrix} B \\ C \end{matrix}; P_2 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \end{pmatrix} \begin{matrix} B \\ C \end{matrix}; P_3 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \end{pmatrix} \begin{matrix} B \\ C \end{matrix}; \\
 P_4 &= \begin{pmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \end{pmatrix} \begin{matrix} B \\ C \end{matrix}; P_5 = \begin{pmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \end{pmatrix} \begin{matrix} B \\ C \end{matrix}; P_6 = \begin{pmatrix} 2 & 0 & 1 \\ 1 & 0 & 0 \end{pmatrix} \begin{matrix} B \\ C \end{matrix}; \\
 P_7 &= \begin{pmatrix} 0 & 4 & 1 \\ 1 & 0 & 2 \end{pmatrix} \begin{matrix} B \\ C \end{matrix}; P_8 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & -3 & 0 \end{pmatrix} \begin{matrix} B \\ C \end{matrix}; \\
 &\begin{pmatrix} 0 & 0 & 1 \\ 0 & 0 & 1 \end{pmatrix}
 \end{aligned}$$



习题1.4($P_{39} - P_{41}$)

1.(2)



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccc|c}
 1 & 0 & 2 & -3 & 1 \\
 0 & 2 & -3 & 1 & 1 \\
 0 & 3 & -4 & 3 & 1 \\
 0 & 4 & -7 & -1 & 1
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccc|l}
 1 & 2 & & & 1 & \\
 0 & 2 & -3 & 1 & & \text{换1、2行} \\
 0 & 3 & -4 & 3 & & \\
 0 & 4 & -7 & -1 & & \text{第2行}(-1)\text{倍加到第1行}
 \end{array} \xrightarrow{C \rightarrow A}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccc|c}
 1 & (2) & & & \\
 0 & 2 & -3 & 1 & 1 \\
 \text{B} & & & & \\
 @0 & 3 & -4 & 3 & \text{C} \\
 & & & & \text{A}
 \end{array}
 \xrightarrow{\substack{\text{换1、2行} \\ \text{第2行}(-1)\text{倍加到第1行}}}
 \begin{array}{cccc|c}
 0 & & & & 1 \\
 0 & 1 & -1 & 2 & \\
 \text{B} & & & & \\
 @0 & 2 & -3 & 1 & \text{C} \\
 & & & & \text{A}
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccc|c}
 1 & (2) & & & \\
 0 & 2 & -3 & 1 & 1 \\
 0 & 3 & -4 & 3 & 1 \\
 0 & 4 & -7 & -1 & 1
 \end{array}
 \begin{array}{l}
 \text{换1、2行} \\
 \text{第2行}(-1)\text{倍加到第1行}
 \end{array}
 \longrightarrow
 \begin{array}{cccc|c}
 0 & 1 & -1 & 2 & 1 \\
 0 & 2 & -3 & 1 & 1 \\
 0 & 4 & -7 & 1 & 1
 \end{array}$$

第1行(-2)倍加到第2行

 $\longrightarrow$

第1行(-4)倍加到第3行



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccc|l}
 1 & 0 & 2 & -3 & 1 & \\
 0 & 2 & -3 & 1 & 1 & \text{换1、2行} \\
 0 & 3 & -4 & 3 & 1 & \\
 0 & 4 & -7 & -1 & 1 & \\
 \hline
 0 & 1 & -1 & 2 & 1 & \\
 0 & 0 & -1 & -3 & -3 & \\
 0 & 0 & -3 & -7 & -7 &
 \end{array}
 \begin{array}{l}
 \\
 \\
 \longrightarrow \\
 \text{第2行}(-1)\text{倍加到第1行} \\
 \text{第1行}(-2)\text{倍加到第2行} \\
 \longrightarrow \\
 \text{第1行}(-4)\text{倍加到第3行}
 \end{array}
 \begin{array}{cccc|l}
 0 & 1 & -1 & 2 & 1 & \\
 0 & 2 & -3 & 1 & 1 & \\
 0 & 4 & -7 & 1 & 1 & \\
 \hline
 0 & 1 & -1 & 2 & 1 & \\
 0 & 0 & -1 & -3 & -3 & \\
 0 & 0 & -3 & -7 & -7 &
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccc|l}
 1 & 0 & 2 & -3 & 1 & \\
 0 & 2 & -3 & 1 & 1 & \text{换1、2行} \\
 0 & 3 & -4 & 3 & 1 & \\
 0 & 4 & -7 & -1 & 1 & \\
 \hline
 0 & 1 & -1 & 2 & 1 & \\
 0 & 0 & -1 & -3 & -3 & \\
 0 & 0 & -3 & -7 & -7 &
 \end{array}
 \begin{array}{l}
 \\
 \\
 \longrightarrow \\
 \text{第2行}(-1)\text{倍加到第1行} \\
 \text{第1行}(-2)\text{倍加到第2行} \\
 \longrightarrow \\
 \text{第1行}(-4)\text{倍加到第3行}
 \end{array}
 \begin{array}{cccc|l}
 0 & 1 & -1 & 2 & 1 & \\
 0 & 2 & -3 & 1 & 1 & \\
 0 & 4 & -7 & 1 & 1 & \\
 \hline
 0 & 1 & -1 & 2 & 1 & \\
 0 & 0 & -1 & -3 & -3 & \\
 0 & 0 & -1 & -3 & -3 &
 \end{array}
 \begin{array}{l}
 \\
 \\
 \\
 \text{第2行}(-3)\text{倍加到第3行} \\
 \longrightarrow \\
 \text{第3行乘}\frac{1}{2}
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccc|l}
 1 & (2) & & & \\
 0 & 2 & -3 & 1 & 1 \\
 0 & 3 & -4 & 3 & 1 \\
 0 & 4 & -7 & -1 & 1
 \end{array}
 \xrightarrow{\text{换1、2行}}
 \begin{array}{cccc|l}
 0 & 1 & -1 & 2 & 1 \\
 0 & 2 & -3 & 1 & 1 \\
 0 & 4 & -7 & 1 & 1 \\
 0 & 1 & -1 & 2 & 1
 \end{array}$$

第1行(-2)倍加到第2行

$$\begin{array}{cccc|l}
 0 & 1 & -1 & 2 & 1 \\
 0 & 0 & -1 & -3 & -1 \\
 0 & 0 & -1 & -3 & -1 \\
 0 & 0 & -1 & -3 & -1
 \end{array}$$

第1行(-4)倍加到第3行

$$\begin{array}{cccc|l}
 0 & 1 & -1 & 2 & 1 \\
 0 & 0 & -1 & -3 & -1 \\
 0 & 0 & 0 & 1 & 1 \\
 0 & 0 & 0 & 1 & 1
 \end{array}$$

第2行(-3)倍加到第3行

$$\begin{array}{cccc|l}
 0 & 1 & -1 & 2 & 1 \\
 0 & 0 & -1 & -3 & -1 \\
 0 & 0 & 0 & 1 & 1 \\
 0 & 0 & 0 & 1 & 1
 \end{array}$$

第3行乘 $\frac{1}{2}$

$$\begin{array}{cccc|l}
 0 & 1 & -1 & 2 & 1 \\
 0 & 0 & -1 & -3 & -1 \\
 0 & 0 & 0 & 1 & 1 \\
 0 & 0 & 0 & 1 & 1
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{l}
 \begin{array}{cccc}
 1 & 2 & & \\
 0 & 2 & -3 & 1 \\
 0 & 3 & -4 & 3 \\
 0 & 4 & -7 & -1
 \end{array}
 \begin{array}{l}
 \text{换1、2行} \\
 \text{第2行(-1)倍加到第1行} \\
 \text{第1行(-2)倍加到第2行} \\
 \text{第1行(-4)倍加到第3行}
 \end{array}
 \begin{array}{cccc}
 0 & 1 & -1 & 2 \\
 0 & 0 & -1 & -3 \\
 0 & 0 & -3 & -7 \\
 0 & 0 & 0 & 1
 \end{array}
 \begin{array}{l}
 \text{第3行3倍加到第2行} \\
 \text{第3行(-2)倍加到第1行}
 \end{array}
 \end{array}
 \rightarrow
 \begin{array}{l}
 \begin{array}{cccc}
 0 & 1 & -1 & 2 \\
 0 & 2 & -3 & 1 \\
 0 & 4 & -7 & 1
 \end{array}
 \begin{array}{l}
 \text{第2行(-3)倍加到第3行} \\
 \text{第3行乘} \frac{1}{2}
 \end{array}
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{lcl}
 \begin{array}{cccc}
 1 & 2 & & \\
 0 & 2 & -3 & 1 \\
 0 & 3 & -4 & 3 \\
 0 & 4 & -7 & -1
 \end{array}
 & \begin{array}{l}
 \text{换1、2行} \\
 \text{第2行(-1)倍加到第1行} \\
 \text{第1行(-2)倍加到第2行} \\
 \text{第1行(-4)倍加到第3行}
 \end{array}
 & \begin{array}{cccc}
 0 & 1 & -1 & 2 \\
 0 & 2 & -3 & 1 \\
 0 & 4 & -7 & 1 \\
 0 & 1 & -1 & 2
 \end{array} \\
 \begin{array}{cccc}
 0 & 1 & -1 & 2 \\
 0 & 0 & -1 & -3 \\
 0 & 0 & 0 & 1
 \end{array}
 & \begin{array}{l}
 \text{第3行3倍加到第2行} \\
 \text{第3行(-2)倍加到第1行}
 \end{array}
 & \begin{array}{cccc}
 0 & 1 & -1 & 0 \\
 0 & 0 & -1 & 0 \\
 0 & 0 & 0 & 1
 \end{array}
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

1(2)

$$\begin{array}{cccc} 0 & 2 & -3 & 1 \\ 0 & 3 & -4 & 3 \end{array}$$

$$\begin{array}{c} B \\ @ \end{array} \begin{array}{c} C \\ A \end{array}$$

换1、2行

$$\begin{array}{cccc} 0 & 4 & -7 & -1 \end{array}$$

第2行(-1)倍加到第1行

第1行(-2)倍加到第2行

→

第1行(-4)倍加到第3行

$$\begin{array}{cccc} 0 & 1 & -1 & 2 \\ 0 & 0 & -1 & -3 \end{array}$$

$$\begin{array}{c} B \\ @ \end{array} \begin{array}{c} C \\ A \end{array}$$

$$\begin{array}{cccc} 0 & 0 & 0 & 1 \end{array}$$

第2行乘(-1)

→

第2行加到第1行

$$\begin{array}{cccc} 0 & 1 & -1 & 2 \\ 0 & 0 & -1 & -3 \end{array}$$

$$\begin{array}{c} B \\ @ \end{array} \begin{array}{c} C \\ A \end{array}$$

$$\begin{array}{cccc} 0 & 0 & -3 & -7 \end{array}$$

第3行3倍加到第2行

→

第3行(-2)倍加到第1行

$$\begin{array}{cccc} 0 & 1 & -1 & 2 \\ 0 & 2 & -3 & 1 \end{array}$$

$$\begin{array}{c} B \\ @ \end{array} \begin{array}{c} C \\ A \end{array}$$

$$\begin{array}{cccc} 0 & 4 & -7 & 1 \end{array}$$

第2行(-3)倍加到第3行

→

第3行乘 $\frac{1}{2}$

$$\begin{array}{cccc} 0 & 1 & -1 & 0 \\ 0 & 0 & -1 & 0 \end{array}$$

$$\begin{array}{c} B \\ @ \end{array} \begin{array}{c} C \\ A \end{array}$$

$$\begin{array}{cccc} 0 & 0 & 0 & 1 \end{array}$$



习题1.4($P_{39} - P_{41}$)

1(2)

$$\begin{pmatrix} 0 & 2 & -3 & 1 \\ 0 & 3 & -4 & 3 \\ 0 & 4 & -7 & -1 \end{pmatrix}$$

换1、2行

$$\begin{pmatrix} 0 & 3 & -4 & 3 \\ 0 & 2 & -3 & 1 \\ 0 & 4 & -7 & -1 \end{pmatrix}$$

→

$$\begin{pmatrix} 0 & 3 & -4 & 3 \\ 0 & 2 & -3 & 1 \\ 0 & 4 & -7 & -1 \end{pmatrix}$$

第2行(-1)倍加到第1行

第1行(-2)倍加到第2行

→

第1行(-4)倍加到第3行

$$\begin{pmatrix} 0 & 1 & -1 & 2 \\ 0 & 0 & -1 & -3 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 1 & -1 & 2 \\ 0 & 0 & -1 & -3 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

第3行3倍加到第2行

→

$$\begin{pmatrix} 0 & 1 & -1 & 2 \\ 0 & 0 & -1 & -3 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

第3行(-2)倍加到第1行

第2行乘(-1)

→

第2行加到第1行

$$\begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 1 & -1 & 2 \\ 0 & 2 & -3 & 1 \\ 0 & 4 & -7 & 1 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 1 & -1 & 2 \\ 0 & 2 & -3 & 1 \\ 0 & 4 & -7 & 1 \end{pmatrix}$$

第2行(-3)倍加到第3行

→

第3行乘 $\frac{1}{2}$

$$\begin{pmatrix} 0 & 1 & -1 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 1 & -1 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 1 & -1 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$



习题1.4($P_{39} - P_{41}$)

$$P_1 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix};$$



习题1.4($P_{39} - P_{41}$)

$$P_1 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}; P_2 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & -1 & 0 \\ 0 & 0 & 1 \end{pmatrix};$$



习题1.4($P_{39} - P_{41}$)

$$P_1 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}; P_2 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & -1 & 0 \\ 0 & 0 & 1 \end{pmatrix}; P_3 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ -2 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{aligned}
 P_1 &= \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \end{pmatrix}; P_2 = \begin{pmatrix} 0 & 1 & 0 \\ 0 & 1 & 0 \end{pmatrix}; P_3 = \begin{pmatrix} 0 & 1 & 0 \\ -2 & 1 & 0 \end{pmatrix} \\
 P_4 &= \begin{pmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ -4 & 0 & 1 \end{pmatrix}
 \end{aligned}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{aligned}
 P_1 &= \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}; P_2 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & -1 & 0 \\ 0 & 0 & 1 \end{pmatrix}; P_3 = \begin{pmatrix} 0 & 1 & 0 \\ -2 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \\
 P_4 &= \begin{pmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{pmatrix}; P_5 = \begin{pmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{pmatrix}; \\
 &\quad \begin{pmatrix} -4 & 0 & 1 \\ 0 & -3 & 1 \end{pmatrix}
 \end{aligned}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{aligned}
 P_1 &= \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}; P_2 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & -1 & 0 \\ 0 & 0 & 1 \end{pmatrix}; P_3 = \begin{pmatrix} 0 & 1 & 0 \\ -2 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \\
 P_4 &= \begin{pmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{pmatrix}; P_5 = \begin{pmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{pmatrix}; P_6 = \begin{pmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{pmatrix} \\
 &\quad \begin{pmatrix} -4 & 0 & 1 \\ 0 & -3 & 1 \\ 0 & 0 & \frac{1}{2} \end{pmatrix}
 \end{aligned}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{aligned}
 P_1 &= \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}; P_2 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & -1 & 0 \\ 0 & 0 & 1 \end{pmatrix}; P_3 = \begin{pmatrix} 0 & 1 & 0 \\ -2 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \\
 P_4 &= \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}; P_5 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}; P_6 = \begin{pmatrix} 0 & 1 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \\
 P_7 &= \begin{pmatrix} -4 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 3 \end{pmatrix};
 \end{aligned}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{aligned}
 P_1 &= \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}; P_2 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & -1 & 0 \\ 0 & 0 & 1 \end{pmatrix}; P_3 = \begin{pmatrix} 0 & 1 & 0 \\ -2 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \\
 P_4 &= \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}; P_5 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}; P_6 = \begin{pmatrix} 0 & 1 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \\
 P_7 &= \begin{pmatrix} 0 & 1 & 3 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}; P_8 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & -2 \\ 0 & 0 & 1 \end{pmatrix};
 \end{aligned}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{aligned}
 P_1 &= \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}; P_2 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & -1 & 0 \\ 0 & 0 & 1 \end{pmatrix}; P_3 = \begin{pmatrix} 0 & 1 & 0 \\ -2 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \\
 P_4 &= \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}; P_5 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}; P_6 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix} \\
 P_7 &= \begin{pmatrix} 0 & 1 & 3 \\ -4 & 0 & 1 \\ 0 & 0 & 1 \end{pmatrix}; P_8 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & -2 \\ 0 & 0 & 1 \end{pmatrix}; P_9 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}
 \end{aligned}$$



习题1.4($P_{39} - P_{41}$)

$$P_1 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \end{pmatrix}; P_2 = \begin{pmatrix} 0 & 1 & 0 \\ 0 & 1 & 0 \end{pmatrix}; P_3 = \begin{pmatrix} 0 & 1 & 0 \\ -2 & 1 & 0 \end{pmatrix}$$

$$P_4 = \begin{pmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \end{pmatrix}; P_5 = \begin{pmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \end{pmatrix}; P_6 = \begin{pmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \end{pmatrix}$$

$$P_7 = \begin{pmatrix} -4 & 0 & 1 \\ 1 & 0 & 0 \end{pmatrix}; P_8 = \begin{pmatrix} 0 & -3 & 1 \\ 1 & 0 & -2 \end{pmatrix}; P_9 = \begin{pmatrix} 0 & 0 & \frac{1}{2} \\ 1 & 0 & 0 \end{pmatrix}$$

$$P_{10} = \begin{pmatrix} 0 & 0 & 1 \\ 1 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$



习题1.4($P_{39} - P_{41}$)

1.(3)



习题1.4($P_{39} - P_{41}$)

1.(3))



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccc|c}
 0 & 1 & (3) &) & 1 \\
 2 & -1 & -1 & 1 & 2 \\
 1 & 1 & -2 & 1 & 4 \\
 4 & -6 & 2 & -2 & 4 \\
 3 & 6 & -6 & 7 & 9
 \end{array}
 \begin{array}{l}
 \text{换1、2行} \\
 \longrightarrow \\
 \text{第1行}(-2)\text{倍加到第2行}
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{ccccc}
 0 & 1 & (3) & & 1 \\
 2 & -1 & -1 & 1 & 2 \\
 1 & 1 & -2 & 1 & 4 \\
 4 & -6 & 2 & -2 & 4 \\
 3 & 6 & -6 & 7 & 9
 \end{array}
 \begin{array}{c}
 \text{C} \\
 \text{C} \\
 \text{C} \\
 \text{A}
 \end{array}
 \begin{array}{c}
 \text{换1、2行} \\
 \longrightarrow \\
 \text{第1行}(-2)\text{倍加到第2行}
 \end{array}
 \begin{array}{ccccc}
 0 & & & & 1 \\
 1 & 1 & -2 & 1 & 4 \\
 0 & -3 & 3 & -1 & -6 \\
 4 & -6 & 2 & -2 & 4 \\
 3 & 6 & -6 & 7 & 9
 \end{array}
 \begin{array}{c}
 \text{C} \\
 \text{C} \\
 \text{C} \\
 \text{A}
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{ccccc}
 0 & 1 & (3) & & 1 \\
 2 & -1 & -1 & 1 & 2 \\
 1 & 1 & -2 & 1 & 4 \\
 4 & -6 & 2 & -2 & 4 \\
 3 & 6 & -6 & 7 & 9
 \end{array}
 \xrightarrow{\substack{\text{换1、2行} \\ \text{第1行}(-2)\text{倍加到第2行}}}
 \begin{array}{ccccc}
 0 & & & & 1 \\
 1 & 1 & -2 & 1 & 4 \\
 0 & -3 & 3 & -1 & -6 \\
 4 & -6 & 2 & -2 & 4 \\
 3 & 6 & -6 & 7 & 9
 \end{array}$$

第1行(-4)倍加到第3行

→

第1行(-3)倍加到第4行



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{ccccc}
 0 & 1 & (3) & & 1 \\
 2 & -1 & -1 & 1 & 2 \\
 1 & 1 & -2 & 1 & 4 \\
 4 & -6 & 2 & -2 & 4 \\
 3 & 6 & -6 & 7 & 9
 \end{array}
 \xrightarrow{\text{换1、2行}}
 \begin{array}{ccccc}
 0 & 1 & 1 & -2 & 1 \\
 1 & 1 & -2 & 1 & 4 \\
 0 & -3 & 3 & -1 & -6 \\
 4 & -6 & 2 & -2 & 4 \\
 3 & 6 & -6 & 7 & 9
 \end{array}
 \xrightarrow{\text{第1行}(-2)\text{倍加到第2行}}
 \begin{array}{ccccc}
 0 & 1 & 1 & -2 & 1 \\
 1 & 1 & -2 & 1 & 4 \\
 0 & -3 & 3 & -1 & -6 \\
 0 & -10 & 10 & -6 & -12 \\
 0 & 3 & 0 & 4 & -3
 \end{array}
 \xrightarrow{\begin{array}{l} \text{第1行}(-4)\text{倍加到第3行} \\ \text{第1行}(-3)\text{倍加到第4行} \end{array}}
 \begin{array}{ccccc}
 0 & 1 & 1 & -2 & 1 \\
 1 & 1 & -2 & 1 & 4 \\
 0 & -3 & 3 & -1 & -6 \\
 0 & -10 & 10 & -6 & -12 \\
 0 & 3 & 0 & 4 & -3
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{ccccc}
 0 & 1 & (3) & & 1 \\
 2 & -1 & -1 & 1 & 2 \\
 1 & 1 & -2 & 1 & 4 \\
 4 & -6 & 2 & -2 & 4 \\
 3 & 6 & -6 & 7 & 9
 \end{array}
 \xrightarrow{\text{换1、2行}}
 \begin{array}{ccccc}
 0 & 1 & 1 & -2 & 1 \\
 1 & 1 & -2 & 1 & 4 \\
 0 & -3 & 3 & -1 & -6 \\
 4 & -6 & 2 & -2 & 4 \\
 3 & 6 & -6 & 7 & 9
 \end{array}
 \xrightarrow{\text{第1行}(-2)\text{倍加到第2行}}
 \begin{array}{ccccc}
 0 & 1 & 1 & -2 & 1 \\
 1 & 1 & -2 & 1 & 4 \\
 0 & -3 & 3 & -1 & -6 \\
 0 & -10 & 10 & -6 & -12 \\
 0 & 3 & 0 & 4 & -3
 \end{array}
 \xrightarrow{\begin{array}{l} \text{第1行}(-4)\text{倍加到第3行} \\ \text{第1行}(-3)\text{倍加到第4行} \end{array}}
 \begin{array}{ccccc}
 0 & 1 & 1 & -2 & 1 \\
 1 & 1 & -2 & 1 & 4 \\
 0 & -3 & 3 & -1 & -6 \\
 0 & -10 & 10 & -6 & -12 \\
 0 & 3 & 0 & 4 & -3
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{ccccc}
 0 & 1 & 1 & -2 & 1 & 4 \\
 2 & -1 & -1 & 1 & 2 & \\
 1 & 1 & -2 & 1 & 4 & \\
 4 & -6 & 2 & -2 & 4 & \\
 3 & 6 & -6 & 7 & 9 &
 \end{array}
 \xrightarrow{\text{换1、2行}}
 \begin{array}{ccccc}
 0 & 1 & 1 & -2 & 1 & 4 \\
 1 & 1 & -2 & 1 & 4 & \\
 0 & -3 & 3 & -1 & -6 & \\
 4 & -6 & 2 & -2 & 4 & \\
 3 & 6 & -6 & 7 & 9 &
 \end{array}
 \xrightarrow{\text{第1行}(-2)\text{倍加到第2行}}
 \begin{array}{ccccc}
 0 & 1 & 1 & -2 & 1 & 4 \\
 1 & 1 & -2 & 1 & 4 & \\
 0 & -3 & 3 & -1 & -6 & \\
 0 & -10 & 10 & -6 & -12 & \\
 0 & 3 & 0 & 4 & -3 &
 \end{array}
 \xrightarrow{\begin{array}{l} \text{第1行}(-4)\text{倍加到第3行} \\ \text{第1行}(-3)\text{倍加到第4行} \end{array}}
 \begin{array}{ccccc}
 0 & 1 & 1 & -2 & 1 & 4 \\
 1 & 1 & -2 & 1 & 4 & \\
 0 & -1 & 1 & -3 & 6 & \\
 0 & -3 & 3 & -1 & -6 & \\
 0 & 3 & 0 & 4 & -3 &
 \end{array}
 \xrightarrow{\begin{array}{l} \text{第2行}(-3)\text{倍加到第3行} \\ \text{换2、3行} \end{array}}
 \begin{array}{ccccc}
 0 & 1 & 1 & -2 & 1 & 4 \\
 1 & 1 & -2 & 1 & 4 & \\
 0 & -1 & 1 & -3 & 6 & \\
 0 & -3 & 3 & -1 & -6 & \\
 0 & 3 & 0 & 4 & -3 &
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccccc}
 0 & 1.(3) & & & & \\
 2 & -1 & -1 & 1 & 2 & \\
 1 & 1 & -2 & 1 & 4 & \\
 4 & -6 & 2 & -2 & 4 & 1 \quad 1 \quad 2
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

换3、4 ÷ 行

→

第4行乘 $\frac{1}{8}$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{l}
 \text{换3、4行} \\
 \longrightarrow \\
 \text{第4行乘 } \frac{1}{8}
 \end{array}
 \begin{array}{ccccc}
 0 & & & & 1 \\
 1 & 1 & -2 & 1 & 4 \\
 0 & -1 & 1 & -3 & 6 \\
 0 & 0 & 3 & -5 & 15 \\
 0 & 0 & 0 & 1 & -3
 \end{array}
 \begin{array}{l}
 \\
 \\
 C \\
 C \\
 C \\
 A
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

	0				1	
换3、4行	1	1	-2	1	4	第4行5倍加到第3行
→	0	-1	1	-3	6	第4行3倍加到第2行
第4行乘 $\frac{1}{8}$	0	0	3	-5	15	→
	0	0	0	1	-3	第4行(-1)倍加到第1行



数学与统计学

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习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccccc}
 & & 0 & & & 1 \\
 & & 1 & 1 & -2 & 1 & 4 \\
 \text{换3、4行} & & 0 & -1 & 1 & -3 & 6 \\
 \rightarrow & & 0 & 0 & 3 & -5 & 15 \\
 \text{第4行乘}\frac{1}{8} & & 0 & 1 & 0 & 0 & 1 & -3 \\
 0 & & & & & & & \\
 1 & 1 & -2 & 0 & 7 & & & \\
 0 & -1 & 1 & 0 & -3 & & & \\
 0 & 0 & 3 & 0 & 0 & & & \\
 0 & 0 & 0 & 1 & -3 & & &
 \end{array}$$

第4行5倍加到第3行

第4行3倍加到第2行

第4行(-1)倍加到第1行

第3行乘 $\frac{1}{3}$

第3行(-1)倍加到第2行

第3行2倍加到第1行



习题1.4($P_{39} - P_{41}$)

		0			1		
		1	1	-2	1	4	第4行5倍加到第3行
换3、4行		0	-1	1	-3	6	第4行3倍加到第2行
→		0	0	3	-5	15	→
第4行乘 $\frac{1}{8}$		0	0	0	1	-3	第4行(-1)倍加到第1行
0	1	1	-2	0	7		1
第3行乘 $\frac{1}{3}$		0	-1	1	0	-3	第3行(-1)倍加到第2行
→		0	0	3	0	0	→
第3行2倍加到第1行		0	0	0	1	-3	



第2行加到第1行



第2行乘(-1)

$$\begin{array}{ccccc|c}
 0 & 1 & 1 & -2 & 1 & 4 \\
 1 & 0 & -1 & 1 & -3 & 6 \\
 0 & 0 & 3 & -5 & 15 & 15 \\
 0 & 0 & 0 & 1 & -3 & -3
 \end{array}
 \begin{array}{l}
 \text{第4行5倍加到第3行} \\
 \text{第4行3倍加到第2行} \\
 \text{第4行}(-1)\text{倍加到第1行}
 \end{array}$$

换3、4行

第4行乘 $\frac{1}{8}$

$$\begin{array}{ccccc|c}
 0 & 1 & 1 & -2 & 0 & 7 \\
 1 & 0 & -1 & 1 & 0 & -3 \\
 0 & 0 & 3 & 0 & 0 & 0 \\
 0 & 0 & 0 & 1 & -3 & -3
 \end{array}
 \begin{array}{l}
 \text{第3行乘}\frac{1}{3} \\
 \text{第3行}(-1)\text{倍加到第2行} \\
 \text{第3行2倍加到第1行}
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

		0			1	
		1	1	-2	1	4
换3、4行		0	-1	1	-3	6
→		0	0	3	-5	15
第4行乘 $\frac{1}{8}$		0	0	0	1	-3
	0	1	0	0	1	-3
	1	1	-2	0	7	
	0	-1	1	0	-3	
	0	0	3	0	0	
	0	0	0	1	-3	
	1	0	0	0	4	
	0	1	0	0	3	
	0	0	1	0	0	
	0	0	0	1	-3	

第4行5倍加到第3行
第4行3倍加到第2行
→
第4行(-1)倍加到第1行
第3行乘 $\frac{1}{3}$
第3行(-1)倍加到第2行
→
第3行2倍加到第1行
第2行加到第1行
→
第2行乘(-1)



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{l}
 \begin{array}{c} \text{换3、4行} \\ \longrightarrow \\ \text{第4行乘} \frac{1}{8} \end{array} \begin{array}{ccccc} 0 & 1 & 1 & -2 & 1 \\ \text{B} & 0 & -1 & 1 & -3 \\ \text{A} & 0 & 0 & 3 & -5 \\ \text{A} & 0 & 0 & 0 & 1 \end{array} \begin{array}{c} 1 \\ \text{C} \\ \text{C} \\ \text{C} \\ \text{A} \end{array} \begin{array}{l} \text{第4行5倍加到第3行} \\ \text{第4行3倍加到第2行} \\ \longrightarrow \\ \text{第4行(-1)倍加到第1行} \end{array} \\
 \begin{array}{ccccc} 0 & 1 & 1 & -2 & 0 \\ \text{B} & 0 & -1 & 1 & 0 \\ \text{A} & 0 & 0 & 3 & 0 \\ \text{A} & 0 & 0 & 0 & 1 \end{array} \begin{array}{c} 1 \\ \text{C} \\ \text{C} \\ \text{C} \\ \text{A} \end{array} \begin{array}{l} \text{第3行乘} \frac{1}{3} \\ \text{第3行(-1)倍加到第2行} \\ \longrightarrow \\ \text{第3行2倍加到第1行} \end{array} \\
 \begin{array}{ccccc} 1 & 0 & 0 & 0 & 4 \\ \text{B} & 0 & 1 & 0 & 3 \\ \text{A} & 0 & 0 & 1 & 0 \\ \text{A} & 0 & 0 & 0 & 1 \end{array} \begin{array}{c} \text{C} \\ \text{C} \\ \text{C} \\ \text{A} \end{array} \begin{array}{l} \text{第2行加到第1行} \\ \longrightarrow \\ \text{第2行乘(-1)} \end{array} \\
 \begin{array}{ccccc} 1 & 0 & 0 & 0 & 4 \\ \text{B} & 0 & 1 & 0 & 3 \\ \text{A} & 0 & 0 & 1 & 0 \\ \text{A} & 0 & 0 & 0 & 1 \end{array} \begin{array}{c} \text{C} \\ \text{C} \\ \text{C} \\ \text{A} \end{array}
 \end{array}$$

其对应的初等 $\dot{Y}$ 阵为

习题1.4($P_{39} - P_{41}$)

$$P_1 = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix};$$



习题1.4($P_{39} - P_{41}$)

$$P_1 = \begin{array}{c} 0 \qquad \qquad 1 \\ \begin{array}{cccc} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{array} \end{array}; P_2 = \begin{array}{c} 0 \qquad \qquad 1 \\ \begin{array}{cccc} 1 & 0 & 0 & 0 \\ -2 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{array} \end{array};$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{c}
 \begin{array}{cc} 0 & 1 \\ \textcircled{0} & \textcircled{1} \end{array} \\
 \begin{array}{cccc} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{array} \\
 @ \quad A
 \end{array}
 P_1 =
 \begin{array}{c}
 \begin{array}{cc} 0 & 1 \\ \textcircled{0} & \textcircled{1} \end{array} \\
 \begin{array}{cccc} 1 & 0 & 0 & 0 \\ -2 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{array} \\
 @ \quad A
 \end{array}
 ; P_2 =
 \begin{array}{c}
 \begin{array}{cc} 0 & 1 \\ \textcircled{0} & \textcircled{1} \end{array} \\
 \begin{array}{cccc} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ -4 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{array} \\
 @ \quad A
 \end{array}
 P_3 =$$



习题1.4($P_{39} - P_{41}$)

$$\begin{aligned}
 P_1 = & \begin{array}{cc} 0 & 1 \\ \textcircled{0} & \textcircled{1} \end{array} \begin{array}{cccc} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{array} ; P_2 = \begin{array}{cc} 0 & 1 \\ \textcircled{0} & \textcircled{1} \end{array} \begin{array}{cccc} 1 & 0 & 0 & 0 \\ -2 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{array} ; P_3 = \begin{array}{cc} 0 & 1 \\ \textcircled{0} & \textcircled{1} \end{array} \begin{array}{cccc} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ -4 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{array} ; \\
 P_4 = & \begin{array}{cc} 0 & 1 \\ \textcircled{0} & \textcircled{1} \end{array} \begin{array}{cccc} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ -3 & 0 & 0 & 1 \end{array} ;
 \end{aligned}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{l}
\begin{array}{cc}
\begin{array}{c} 0 \\ \textcircled{A} \end{array} & \begin{array}{c} 1 \\ A \end{array} \\
\begin{array}{cccc} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{array}
\end{array} ;
\begin{array}{cc}
\begin{array}{c} 0 \\ \textcircled{A} \end{array} & \begin{array}{c} 1 \\ A \end{array} \\
\begin{array}{cccc} 1 & 0 & 0 & 0 \\ -2 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{array}
\end{array} ;
\begin{array}{cc}
\begin{array}{c} 0 \\ \textcircled{A} \end{array} & \begin{array}{c} 1 \\ A \end{array} \\
\begin{array}{cccc} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ -4 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{array}
\end{array} \\
\\
\begin{array}{cc}
\begin{array}{c} 0 \\ \textcircled{A} \end{array} & \begin{array}{c} 1 \\ A \end{array} \\
\begin{array}{cccc} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ -3 & 0 & 0 & 1 \end{array}
\end{array} ;
\begin{array}{cc}
\begin{array}{c} 0 \\ \textcircled{A} \end{array} & \begin{array}{c} 1 \\ A \end{array} \\
\begin{array}{cccc} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & -3 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{array}
\end{array} ;
\begin{array}{cc}
\begin{array}{c} 0 \\ \textcircled{A} \end{array} & \begin{array}{c} 1 \\ A \end{array} \\
\begin{array}{cccc} 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{array}
\end{array}
\end{array}$$



习题1.4($P_{39} - P_{41}$)

$$P_7 = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & -3 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix};$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{c}
 \begin{array}{cccc}
 0 & & 1 & \\
 1 & 0 & 0 & 0 \\
 0 & 1 & 0 & 0 \\
 0 & -3 & 1 & 0 \\
 @ & & & A \\
 0 & 0 & 0 & 1
 \end{array} \\
 P_7 =
 \end{array}
 ; P_8 =
 \begin{array}{c}
 \begin{array}{cccc}
 0 & & 1 & \\
 1 & 0 & 0 & 0 \\
 0 & 1 & 0 & 0 \\
 0 & 0 & 1 & 0 \\
 @ & & & A \\
 0 & 3 & 0 & 1
 \end{array}
 \end{array}
 ; P_9 =
 \begin{array}{c}
 \begin{array}{cccc}
 0 & & 1 & \\
 1 & 0 & 0 & 0 \\
 0 & 1 & 0 & 0 \\
 0 & 0 & 0 & 1 \\
 @ & & & A \\
 0 & 0 & 1 & 0
 \end{array}
 \end{array}
 ;$$



习题1.4($P_{39} - P_{41}$)

$$\begin{aligned}
P_7 &= \begin{array}{cccc} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & -3 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 \end{array}; P_8 = \begin{array}{cccc} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 3 & 0 & 1 \end{array}; P_9 = \begin{array}{cccc} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{array}; \\
P_{10} &= \begin{array}{cccc} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & \frac{1}{\omega} \end{array};
\end{aligned}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{l}
P_7 = \begin{array}{cccc} 0 & 1 & 1 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & -3 & 1 & 0 \\ @ & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 \end{array}; P_8 = \begin{array}{cccc} 0 & 1 & 1 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ @ & 0 & 3 & 1 \\ 0 & 3 & 0 & 1 \end{array}; P_9 = \begin{array}{cccc} 0 & 1 & 1 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ @ & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{array}; \\
P_{10} = \begin{array}{cccc} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ @ & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{1}{\infty} \end{array}; P_{11} = \begin{array}{cccc} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 5 \\ @ & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 \end{array};
\end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{aligned}
 P_7 = & \begin{array}{cccc} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & -3 & 1 & 0 \\ @ & & & A \\ 0 & 0 & 0 & 1 \\ 0 & & & 1 \end{array}; P_8 = \begin{array}{cccc} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ @ & & & A \\ 0 & 3 & 0 & 1 \\ 0 & & & 1 \end{array}; P_9 = \begin{array}{cccc} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ @ & & & A \\ 0 & 0 & 1 & 0 \\ 0 & & & 1 \end{array}; \\
 P_{10} = & \begin{array}{cccc} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ @ & & & A \\ 0 & 0 & 0 & \frac{1}{8} \end{array}; P_{11} = \begin{array}{cccc} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 5 \\ @ & & & A \\ 0 & 0 & 0 & 1 \end{array}; P_{12} = \begin{array}{cccc} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 3 \\ 0 & 0 & 1 & 0 \\ @ & & & A \\ 0 & 0 & 0 & 1 \end{array}
 \end{aligned}$$



习题1.4($P_{39} - P_{41}$)

$$P_{13} = \begin{pmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix},$$



习题1.4($P_{39} - P_{41}$)

$$P_{13} = \begin{pmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}, P_{14} = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & \frac{1}{3} & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix},$$



习题1.4($P_{39} - P_{41}$)

$$P_{13} = \begin{pmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}, P_{14} = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & \frac{1}{3} & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}, P_{15} = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix},$$



习题1.4($P_{39} - P_{41}$)

$$P_{13} = \begin{pmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}, P_{14} = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & \frac{1}{3} & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}, P_{15} = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix},$$

$$P_{16} = \begin{pmatrix} 1 & 0 & 2 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix};$$



习题1.4($P_{39} - P_{41}$)

$$P_{13} = \begin{pmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}, P_{14} = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & \frac{1}{3} & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}, P_{15} = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix},$$

$$P_{16} = \begin{pmatrix} 1 & 0 & 2 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}; P_{17} = \begin{pmatrix} 1 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix};$$



习题1.4($P_{39} - P_{41}$)

$$P_{13} = \begin{pmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}, P_{14} = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & \frac{1}{3} & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$



习题1.4($P_{39} - P_{41}$)

1.(4))



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccccc}
 0 & \textcolor{red}{1.(4)} &) & & & 1 \\
 1 & -1 & 3 & -4 & 3 & \\
 \textcircled{1} & 3 & -3 & 5 & -4 & 1 \\
 \textcircled{2} & 2 & -2 & 3 & -2 & 0 \\
 3 & -3 & 4 & -2 & -1 &
 \end{array}
 \begin{array}{c}
 C \\
 C \\
 C \\
 A
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{ccccc}
 0 & 1 & (4) & & 1 \\
 1 & -1 & 3 & -4 & 3 \\
 3 & -3 & 5 & -4 & 1 \\
 2 & -2 & 3 & -2 & 0 \\
 3 & -3 & 4 & -2 & -1
 \end{array}
 \begin{array}{l}
 \\
 \text{第1行}(-3)\text{倍加到第2行} \\
 \text{第1行}(-2)\text{倍加到第3行} \\
 \longrightarrow \\
 \text{第1行}(-3)\text{倍加到第4行}
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{ccccc}
 0 & 1 & -1 & 3 & -4 \\
 1 & -1 & 3 & -4 & 3 \\
 3 & -3 & 5 & -4 & 1 \\
 2 & -2 & 3 & -2 & 0 \\
 3 & -3 & 4 & -2 & -1
 \end{array}
 \begin{array}{l}
 \\
 \text{第1行}(-3)\text{倍加到第2行} \\
 \text{第1行}(-2)\text{倍加到第3行} \\
 \longrightarrow \\
 \text{第1行}(-3)\text{倍加到第4行}
 \end{array}$$

$$\begin{array}{ccccc}
 0 & 1 & -1 & 3 & -4 \\
 0 & 0 & -4 & 8 & -8 \\
 0 & 0 & -3 & 6 & -6 \\
 0 & 0 & -5 & 10 & -10
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{ccccc}
 0 & \textcolor{red}{1.(4)} & & & 1 \\
 1 & -1 & 3 & -4 & 3 \\
 3 & -3 & 5 & -4 & 1 \\
 2 & -2 & 3 & -2 & 0 \\
 3 & -3 & 4 & -2 & -1
 \end{array}
 \begin{array}{l}
 \\
 \text{第1行}(-3)\text{倍加到第2行} \\
 \text{第1行}(-2)\text{倍加到第3行} \\
 \longrightarrow \\
 \text{第1行}(-3)\text{倍加到第4行}
 \end{array}$$

$$\begin{array}{ccccc}
 0 & & & & 1 \\
 1 & -1 & 3 & -4 & 3 \\
 0 & 0 & -4 & 8 & -8 \\
 0 & 0 & -3 & 6 & -6 \\
 0 & 0 & -5 & 10 & -10
 \end{array}$$

第2行乘 $(-\frac{1}{4})$

第2行3倍加到第3行

 $\longrightarrow$

第2行5倍加到第4行

第2行 (-3) 倍加到第1行

习题1.4($P_{39} - P_{41}$)

$$\begin{array}{ccccc}
 0 & 1 & 3 & -4 & 3 \\
 1 & -1 & 3 & -4 & 3 \\
 3 & -3 & 5 & -4 & 1 \\
 2 & -2 & 3 & -2 & 0 \\
 3 & -3 & 4 & -2 & -1
 \end{array}
 \begin{array}{l}
 1 \\
 \text{第1行(-3)倍加到第2行} \\
 \text{第1行(-2)倍加到第3行} \\
 \longrightarrow \\
 \text{第1行(-3)倍加到第4行} \\
 \text{第2行乘}(-\frac{1}{4}) \\
 \text{第2行3倍加到第3行} \\
 \longrightarrow \\
 \text{第2行5倍加到第4行} \\
 \text{第2行(-3)倍加到第1行}
 \end{array}
 \begin{array}{c}
 \text{C} \\
 \text{C} \\
 \text{C} \\
 \text{A}
 \end{array}$$

$$\begin{array}{ccccc}
 0 & 1 & -1 & 3 & -4 \\
 1 & -1 & 3 & -4 & 3 \\
 0 & 0 & -4 & 8 & -8 \\
 0 & 0 & -3 & 6 & -6 \\
 0 & 0 & -5 & 10 & -10
 \end{array}
 \begin{array}{c}
 1 \\
 \text{C} \\
 \text{C} \\
 \text{C} \\
 \text{A}
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$P_1 = \begin{pmatrix} 0 & 1 & 0 & 0 \\ -3 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix};$$



习题1.4($P_{39} - P_{41}$)

$$P_1 = \begin{array}{c} 0 \\ 1 \\ -3 \\ 0 \\ 0 \end{array} \begin{array}{cccc} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{array} \begin{array}{c} 1 \\ 0 \\ 0 \\ 0 \\ 1 \end{array} \begin{array}{c} 0 \\ 1 \\ -2 \\ 0 \\ 0 \end{array} \begin{array}{cccc} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{array} \begin{array}{c} 1 \\ 0 \\ 0 \\ 0 \\ 1 \end{array} ; P_2 = \begin{array}{c} 0 \\ 1 \\ 0 \\ -2 \\ 0 \end{array} \begin{array}{cccc} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{array} \begin{array}{c} 1 \\ 0 \\ 0 \\ 0 \\ 1 \end{array} \begin{array}{c} 0 \\ 1 \\ -2 \\ 0 \\ 0 \end{array} \begin{array}{cccc} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{array} \begin{array}{c} 1 \\ 0 \\ 0 \\ 0 \\ 1 \end{array} ;$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{c}
 \begin{array}{ccccc}
 & 0 & & & 1 \\
 @ & 1 & 0 & 0 & 0 \\
 & -3 & 1 & 0 & 0 \\
 & 0 & 0 & 1 & 0 \\
 & 0 & 0 & 0 & 1
 \end{array}
 \end{array}
 ; P_2 = \begin{array}{c}
 \begin{array}{ccccc}
 & 0 & & & 1 \\
 @ & 1 & 0 & 0 & 0 \\
 & 0 & 1 & 0 & 0 \\
 & -2 & 0 & 1 & 0 \\
 & 0 & 0 & 0 & 1
 \end{array}
 \end{array}
 ; P_3 = \begin{array}{c}
 \begin{array}{ccccc}
 & 0 & & & 1 \\
 @ & 1 & 0 & 0 & 0 \\
 & 0 & 1 & 0 & 0 \\
 & 0 & 0 & 1 & 0 \\
 & -3 & 0 & 0 & 1
 \end{array}
 \end{array}
 ;$$



习题1.4($P_{39} - P_{41}$)

$$\begin{aligned}
 P_1 = & \begin{array}{ccccc} 0 & & & & 1 \\ @ & 1 & 0 & 0 & 0 \\ & -3 & 1 & 0 & 0 \\ & 0 & 0 & 1 & 0 \\ & 0 & 0 & 0 & 1 \end{array}; P_2 = \begin{array}{ccccc} 0 & & & & 1 \\ @ & 1 & 0 & 0 & 0 \\ & 0 & 1 & 0 & 0 \\ & -2 & 0 & 1 & 0 \\ & 0 & 0 & 0 & 1 \end{array}; P_3 = \begin{array}{ccccc} 0 & & & & 1 \\ @ & 1 & 0 & 0 & 0 \\ & 0 & 1 & 0 & 0 \\ & 0 & 0 & 1 & 0 \\ & -3 & 0 & 0 & 1 \end{array}; \\
 P_4 = & \begin{array}{ccccc} 0 & & & & 1 \\ @ & 1 & 0 & 0 & 0 \\ & 0 & -\frac{1}{4} & 0 & 0 \\ & 0 & 0 & 1 & 0 \\ & 0 & 0 & 0 & 1 \end{array};
 \end{aligned}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{aligned}
 P_1 &= \begin{array}{ccccc} 0 & & & & 1 \\ \textcircled{1} & 1 & 0 & 0 & 0 \\ -3 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{array}; P_2 = \begin{array}{ccccc} 0 & & & & 1 \\ \textcircled{1} & 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ -2 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{array}; P_3 = \begin{array}{ccccc} 0 & & & & 1 \\ \textcircled{1} & 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ -3 & 0 & 0 & 0 & 1 \end{array}; \\
 P_4 &= \begin{array}{ccccc} 0 & & & & 1 \\ \textcircled{1} & 1 & 0 & 0 & 0 \\ 0 & -\frac{1}{4} & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \end{array}; P_5 = \begin{array}{ccccc} 0 & & & & 1 \\ \textcircled{1} & 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 3 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \end{array};
 \end{aligned}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{aligned}
 P_1 &= \begin{array}{cc} 0 & 1 \\ \textcircled{1} & 1 \ 0 \ 0 \ 0 \\ -3 & 1 \ 0 \ 0 \\ 0 & 0 \ 1 \ 0 \\ 0 & 0 \ 0 \ 1 \end{array}; P_2 = \begin{array}{cc} 0 & 1 \\ \textcircled{1} & 1 \ 0 \ 0 \ 0 \\ -2 & 0 \ 1 \ 0 \\ 0 & 0 \ 0 \ 1 \end{array}; P_3 = \begin{array}{cc} 0 & 1 \\ \textcircled{1} & 1 \ 0 \ 0 \ 0 \\ 0 & 1 \ 0 \ 0 \\ 0 & 0 \ 1 \ 0 \\ -3 & 0 \ 0 \ 1 \end{array}; \\
 P_4 &= \begin{array}{cc} 0 & 1 \\ \textcircled{1} & 1 \ 0 \ 0 \ 0 \\ 0 & -\frac{1}{4} \ 0 \ 0 \\ 0 & 0 \ 1 \ 0 \\ 0 & 0 \ 0 \ 1 \end{array}; P_5 = \begin{array}{cc} 0 & 1 \\ \textcircled{1} & 1 \ 0 \ 0 \ 0 \\ 0 & 1 \ 0 \ 0 \\ 0 & 3 \ 1 \ 0 \\ 0 & 0 \ 0 \ 1 \end{array}; P_6 = \begin{array}{cc} 0 & 1 \\ \textcircled{1} & 1 \ 0 \ 0 \ 0 \\ 0 & 1 \ 0 \ 0 \\ 0 & 0 \ 1 \ 0 \\ 0 & 5 \ 0 \ 1 \end{array};
 \end{aligned}$$



习题1.4($P_{39} - P_{41}$)

$$P_7 = \begin{pmatrix} 0 & 1 & -3 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$



习题1.4($P_{39} - P_{41}$)

$$P_7 = \begin{pmatrix} 0 & 1 & -3 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix} :$$

1.(5))



习题1.4($P_{39} - P_{41}$)

$$P_7 = \begin{pmatrix} 0 & 1 & -3 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix} \begin{matrix} C \\ C \\ C \\ C \\ A \end{matrix} :$$

$$\begin{pmatrix} 0 & 1 & 3 & 1 & 4 \\ 1 & -3 & 8 & 2 & 2 \\ 2 & 12 & -2 & 12 & 12 \end{pmatrix} \begin{matrix} 1 \\ 1 \\ 1 \\ 1 \\ 1 \end{matrix} \begin{matrix} C \\ C \\ C \\ C \\ A \end{matrix}$$



习题1.4($P_{39} - P_{41}$)

$$P_7 = \begin{pmatrix} 0 & 1 & -3 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix} \begin{matrix} C \\ C \\ C \\ C \\ A \end{matrix} :$$

$$\begin{pmatrix} 0 & 1 & -3 & 0 & 0 \\ 1 & 3 & 1 & 4 & 1 \\ 2 & -3 & 8 & 2 & 2 \end{pmatrix} \begin{matrix} C \\ C \\ A \end{matrix} \xrightarrow{\begin{matrix} \text{第1行}(-2)\text{倍加到第2行} \\ \text{第1行}(-2)\text{倍加到第3行} \end{matrix}}$$



习题1.4($P_{39} - P_{41}$)

$$P_7 = \begin{pmatrix} 0 & 1 & -3 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix} \begin{matrix} C \\ C \\ C \\ A \\ A \end{matrix} :$$

$$\begin{pmatrix} 0 & 1 & -3 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix} \begin{matrix} C \\ C \\ C \\ A \\ A \end{matrix} \xrightarrow{1.(5)} \begin{pmatrix} 0 & 1 & -3 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix} \begin{matrix} C \\ C \\ C \\ A \\ A \end{matrix}$$

第1行(-2)倍加到第2行

第1行(-2)倍加到第3行

$$\begin{pmatrix} 0 & 1 & -3 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix} \begin{matrix} C \\ C \\ C \\ A \\ A \end{matrix} \xrightarrow{1.(5)} \begin{pmatrix} 0 & 1 & -3 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix} \begin{matrix} C \\ C \\ C \\ A \\ A \end{matrix}$$

第1行(-2)倍加到第3行



习题1.4($P_{39} - P_{41}$)

$$P_7 = \begin{pmatrix} 0 & 1 & -3 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix} \begin{matrix} C \\ C \\ C \\ A \\ C \end{matrix} :$$

$$\begin{pmatrix} 0 & 1 & -3 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix} \begin{matrix} C \\ C \\ C \\ A \\ C \end{matrix} \xrightarrow{1.(5)} \begin{pmatrix} 0 & 1 & -3 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix} \begin{matrix} C \\ C \\ C \\ A \\ C \end{matrix}$$

第1行(-2)倍加到第2行

第1行(-2)倍加到第3行

$$\begin{pmatrix} 0 & 1 & -3 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix} \begin{matrix} C \\ C \\ C \\ A \\ C \end{matrix} \xrightarrow{1.(5)} \begin{pmatrix} 0 & 1 & -3 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix} \begin{matrix} C \\ C \\ C \\ A \\ C \end{matrix}$$

第2行乘 $-\frac{1}{9}$

第2行(-6)倍加到第3行

第2行(-3)倍加到第1行



习题1.4($P_{39} - P_{41}$)

$$P_7 = \begin{pmatrix} 0 & 1 & -3 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix} \begin{matrix} C \\ C \\ C \\ A \\ C \end{matrix} :$$

$$\begin{array}{cccc|l} 0 & 1 & -3 & 1 & \\ 1 & 3 & 1 & 4 & \text{第1行}(-2)\text{倍加到第2行} \\ \text{B} @ 2 & -3 & 8 & 2 & A \longrightarrow \\ 2 & 12 & -2 & 12 & \text{第1行}(-2)\text{倍加到第3行} \end{array}$$

$$\begin{array}{cccc|l} 0 & 1 & -3 & 1 & \\ 1 & 3 & 1 & 4 & \\ \text{B} @ 0 & -9 & 6 & -6 & C \\ 0 & 6 & -4 & 4 & \end{array}$$

$$\begin{array}{cccc|l} 0 & 1 & 0 & 3 & 2 \\ 1 & 0 & 3 & 2 & \\ \text{B} @ 0 & 1 & -\frac{2}{3} & \frac{2}{3} & C \\ 0 & 0 & 0 & 0 & \end{array}$$

第2行乘 $-\frac{1}{9}$

第2行 (-6) 倍加到第3行

→

第2行 (-3) 倍加到第1行



习题1.4($P_{39} - P_{41}$)

$$P_1 = \begin{pmatrix} 0 & 1 & 0 & 0 \\ -2 & 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix};$$



习题1.4($P_{39} - P_{41}$)

$$P_1 = \begin{pmatrix} 0 & 1 & 0 & 0 \\ -2 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix}; P_2 = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ -2 & 0 & 1 & 0 \end{pmatrix};$$



习题1.4($P_{39} - P_{41}$)

$$\begin{aligned}
 P_1 &= \begin{pmatrix} 0 & 1 & 0 & 0 \\ -2 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix} A; P_2 = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ -2 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix} A; P_3 = \\
 &\begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & -\frac{1}{9} & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix} A;
 \end{aligned}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{aligned}
 P_1 &= \begin{pmatrix} 0 & 1 & 0 & 0 \\ -2 & 1 & 0 & 0 \end{pmatrix} \begin{matrix} B \\ A \end{matrix}; P_2 = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{pmatrix} \begin{matrix} B \\ A \end{matrix}; P_3 = \\
 &\begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & -\frac{1}{9} & 0 & 0 \end{pmatrix} \begin{matrix} B \\ A \end{matrix}; P_4 = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{pmatrix} \begin{matrix} B \\ A \end{matrix}; \\
 &\begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix} \begin{matrix} B \\ A \end{matrix}; P_5 = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & -6 & 1 & 0 \end{pmatrix} \begin{matrix} B \\ A \end{matrix};
 \end{aligned}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{aligned}
 P_1 &= \begin{pmatrix} 0 & 1 & 0 & 0 \\ -2 & 1 & 0 & 0 \end{pmatrix} \begin{matrix} B \\ A \end{matrix}; P_2 = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{pmatrix} \begin{matrix} B \\ A \end{matrix}; P_3 = \\
 &\begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{pmatrix} \begin{matrix} B \\ A \end{matrix}; P_4 = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{pmatrix} \begin{matrix} B \\ A \end{matrix}; P_5 = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{pmatrix} \begin{matrix} B \\ A \end{matrix}: \\
 &\begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{pmatrix} \begin{matrix} B \\ A \end{matrix}; P_4 = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{pmatrix} \begin{matrix} B \\ A \end{matrix}; P_5 = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{pmatrix} \begin{matrix} B \\ A \end{matrix}:
 \end{aligned}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{aligned}
 P_1 &= \begin{pmatrix} 0 & 1 & 0 & 0 \\ -2 & 1 & 0 & 0 \end{pmatrix}; P_2 = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{pmatrix}; P_3 = \\
 &\begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & -\frac{1}{9} & 0 & 0 \end{pmatrix}; P_4 = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{pmatrix}; P_5 = \begin{pmatrix} 0 & 1 & -3 & 0 \\ 0 & 1 & 0 & 0 \end{pmatrix}; \\
 &\begin{pmatrix} 0 & 0 & 1 & 0 \\ 0 & -6 & 1 & 0 \end{pmatrix}
 \end{aligned}$$

1.(6))



习题1.4($P_{39} - P_{41}$)

$$P_1 = \begin{pmatrix} 0 & 1 & 0 & 0 \\ -2 & 1 & 0 & 0 \end{pmatrix}; P_2 = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{pmatrix}; P_3 =$$

$$\begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & -\frac{1}{9} & 0 & 0 \end{pmatrix}; P_4 = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{pmatrix}; P_5 = \begin{pmatrix} 0 & 1 & -3 & 0 \\ 0 & 1 & 0 & 0 \end{pmatrix};$$

1.(6))

$$\begin{pmatrix} 0 & 1 & 0 & 0 & 1 \\ 3 & 2 & 1 & 0 & 4 \\ 2 & 1 & 4 & 4 & -3 \\ 2 & 0 & 3 & 1 & -2 \\ 2 & 3 & -1 & 2 & 5 \end{pmatrix}$$



习题1.4($P_{39} - P_{41}$)

$$P_1 = \begin{pmatrix} 0 & 1 & 0 & 0 \\ -2 & 1 & 0 & 0 \end{pmatrix}; P_2 = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{pmatrix}; P_3 =$$

$$\begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & -\frac{1}{9} & 0 & 0 \end{pmatrix}; P_4 = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{pmatrix}; P_5 = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{pmatrix};$$

1.(6))

$$\begin{pmatrix} 0 & 1 & 0 & 0 & 4 \\ 3 & 2 & 1 & 0 & 4 \\ 2 & 1 & 4 & 4 & -3 \\ 2 & 0 & 3 & 1 & -2 \\ 2 & 3 & -1 & 2 & 5 \end{pmatrix} \begin{matrix} \text{第2行}(-1)\text{倍加到第1行} \\ \text{第1行}(-2)\text{倍加到第2行} \\ \text{第1行}(-2)\text{倍加到第3行} \\ \longrightarrow \\ \text{第1行}(-2)\text{倍加到第4行} \end{matrix}$$



习题1.4($P_{39} - P_{41}$)

$$P_1 = \begin{pmatrix} 0 & 1 & 0 & 0 \\ -2 & 1 & 0 & 0 \end{pmatrix}; P_2 = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{pmatrix}; P_3 =$$

$$\begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & -\frac{1}{9} & 0 & 0 \end{pmatrix}; P_4 = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{pmatrix}; P_5 = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{pmatrix}:$$

1.(6))

$$\begin{pmatrix} 0 & 3 & 2 & 1 & 0 & 4 \\ 2 & 1 & 4 & 4 & -3 & -2 \\ 2 & 0 & 3 & 1 & -2 & -2 \\ 2 & 3 & -1 & 2 & 5 & 5 \end{pmatrix}$$

第2行(-1)倍加到第1行
第1行(-2)倍加到第2行
第1行(-2)倍加到第3行
→
第1行(-2)倍加到第4行

$$\begin{pmatrix} 0 & 1 & 1 & -3 & -4 & 7 \\ 0 & -1 & 10 & 12 & -17 & -17 \\ 0 & -2 & 9 & 9 & -16 & -16 \\ 0 & 1 & 5 & 10 & -9 & -9 \end{pmatrix}$$



习题1.4($P_{39} - P_{41}$)

第2行(-2)倍加到第3行

→

第2行加到第4行



习题1.4($P_{39} - P_{41}$)

	0				1
	1	1	-3	-4	7
第2行(-2)倍加到第3行	0	-1	10	12	-17
→	0	0	-11	-15	18
第2行加到第4行	0	0	15	22	-26



习题1.4($P_{39} - P_{41}$)

	0				1	
	1	1	-3	-4	7	第4行乘3
第2行(-2)倍加到第3行	0	-1	10	12	-17	第3行4倍加到第4行
→	0	0	-11	-15	18	→
第2行加到第4行	0	0	15	22	-26	换3、4行



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{ccccc}
 & 0 & & & 1 \\
 & 1 & 1 & -3 & -4 & 7 \\
 \text{第2行(-2)倍加到第3行} & \downarrow & & & & \downarrow & \text{第4行乘3} \\
 \rightarrow & 0 & -1 & 10 & 12 & -17 & \downarrow & \text{第3行4倍加到第4行} \\
 & @ & 0 & 0 & -11 & -15 & 18 & \downarrow & \rightarrow \\
 \text{第2行加到第4行} & & 0 & 0 & 15 & 22 & -26 & \text{换3、4行} \\
 0 & & & & 1 & & & \\
 & 1 & 1 & -3 & -4 & 7 & & \\
 \downarrow & 0 & -1 & 10 & 12 & -17 & & \downarrow \\
 @ & 0 & 0 & 1 & 6 & -6 & & \downarrow \\
 & 0 & 0 & -11 & -15 & 18 & &
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccccc}
 & 0 & & & & 1 \\
 & 1 & 1 & -3 & -4 & 7 \\
 \text{第2行(-2)倍加到第3行} & \downarrow & & & & \downarrow & \text{第4行乘3} \\
 \rightarrow & 0 & -1 & 10 & 12 & -17 & \downarrow & \text{第3行4倍加到第4行} \\
 & @ & 0 & 0 & -11 & -15 & 18 & \downarrow & \rightarrow \\
 \text{第2行加到第4行} & & 0 & 0 & 15 & 22 & -26 & \text{换3、4行} \\
 0 & & & & 1 & & & \\
 & 1 & 1 & -3 & -4 & 7 & & \text{第3行11倍加到第4行} \\
 \downarrow & 0 & -1 & 10 & 12 & -17 & & \downarrow & \text{第4行乘}(-\frac{1}{51}) \\
 @ & 0 & 0 & 1 & 6 & -6 & & \rightarrow \\
 & 0 & 0 & -11 & -15 & 18 & & \text{第4行乘(-6)加到第3行}
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{ccccc}
 & 0 & & & 1 \\
 & 1 & 1 & -3 & -4 & 7 \\
 \text{第2行(-2)倍加到第3行} & \text{第4行乘3} \\
 \rightarrow & 0 & -1 & 10 & 12 & -17 \\
 & 0 & 0 & -11 & -15 & 18 \\
 \text{第2行加到第4行} & \text{第3行4倍加到第4行} \\
 & 0 & 0 & 15 & 22 & -26 \\
 & & & & & \text{换3、4行} \\
 0 & 1 & 1 & -3 & -4 & 7 \\
 & 0 & -1 & 10 & 12 & -17 \\
 @ & 0 & 0 & 1 & 6 & -6 \\
 & 0 & 0 & -11 & -15 & 18 \\
 & 1 & 1 & -3 & -4 & 7 \\
 & 0 & -1 & 10 & 12 & -17 \\
 @ & 0 & 0 & 1 & 0 & -\frac{6}{17} \\
 & 0 & 0 & 0 & 1 & -\frac{16}{17}
 \end{array}$$

第3行11倍加到第4行

第4行乘 $(-\frac{1}{51})$

第4行乘(-6)加到第3行



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{ccccc}
 & 0 & & & 1 \\
 & 1 & 1 & -3 & -4 & 7 \\
 \text{第2行}(-2)\text{倍加到第3行} & \text{第4行乘3} \\
 \rightarrow & 0 & -1 & 10 & 12 & -17 \\
 & 0 & 0 & -11 & -15 & 18 \\
 \text{第2行加到第4行} & \text{第3行4倍加到第4行} \\
 & 0 & 0 & 1 & 15 & 22 & -26 \\
 & & & & & & \text{换3、4行} \\
 0 & 1 & 1 & -3 & -4 & 7 \\
 & 0 & -1 & 10 & 12 & -17 \\
 @ & 0 & 0 & 1 & 6 & -6 \\
 & 0 & 0 & -11 & -15 & 18 \\
 0 & 1 & 1 & -3 & -4 & 7 \\
 & 0 & -1 & 10 & 12 & -17 \\
 @ & 0 & 0 & 1 & 0 & -\frac{6}{17} \\
 & 0 & 0 & 0 & 1 & -\frac{16}{17}
 \end{array}$$

第3行11倍加到第4行
 第4行乘 $(-\frac{1}{51})$
 第4行乘 (-6) 加到第3行
 第4行乘 (-12) 加到第2行
 第4行乘4加到第1行
 第3行乘 (-10) 加到第2行



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{ccccc}
 0 & & & & 1 \\
 1 & 1 & -3 & 0 & \frac{55}{17} \\
 0 & -1 & 0 & 0 & -\frac{37}{17} \\
 0 & 0 & 1 & 0 & -\frac{6}{17} \\
 0 & 0 & 0 & 1 & -\frac{16}{17}
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{ccccc}
 0 & & & & 1 \\
 1 & 1 & -3 & 0 & \frac{55}{17} \\
 0 & -1 & 0 & 0 & -\frac{37}{17} \\
 0 & 0 & 1 & 0 & -\frac{6}{17} \\
 0 & 0 & 0 & 1 & -\frac{16}{17}
 \end{array}
 \begin{array}{l}
 \\
 \\
 \text{C} \\
 \text{C} \\
 \text{A}
 \end{array}
 \begin{array}{l}
 \text{第3行乘3加到第1行} \\
 \text{第2行加到第1行} \\
 \longrightarrow \\
 \text{第2行乘}(-1)
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{ccccc}
 0 & & & & 1 \\
 1 & 1 & -3 & 0 & \frac{55}{17} \\
 0 & -1 & 0 & 0 & -\frac{37}{17} \\
 0 & 0 & 1 & 0 & -\frac{6}{17} \\
 0 & 0 & 0 & 1 & -\frac{16}{17}
 \end{array}
 \begin{array}{l}
 \\
 \text{第3行乘3加到第1行} \\
 \text{第2行加到第1行} \\
 \longrightarrow \\
 \text{第2行乘}(-1)
 \end{array}$$

$$\begin{array}{ccccc}
 1 & 0 & 0 & 0 & 0 \\
 0 & 1 & 0 & 0 & \frac{37}{17} \\
 0 & 0 & 1 & 0 & -\frac{6}{17} \\
 0 & 0 & 0 & 1 & -\frac{16}{17}
 \end{array}
 \begin{array}{l}
 \\
 \\
 \\
 \text{相应的初等 } \gamma \text{ 阵为:}
 \end{array}$$

$$P_1 = \begin{array}{ccccc}
 1 & -1 & 0 & 0 & 0 \\
 0 & 1 & 0 & 0 & 0 \\
 0 & 0 & 1 & 0 & 0 \\
 0 & 0 & 0 & 1 & 0
 \end{array};$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{ccccc}
 0 & & & & 1 \\
 1 & 1 & -3 & 0 & \frac{55}{17} \\
 0 & -1 & 0 & 0 & -\frac{37}{17} \\
 0 & 0 & 1 & 0 & -\frac{6}{17} \\
 0 & 0 & 0 & 1 & -\frac{16}{17}
 \end{array}
 \begin{array}{l}
 \\
 \text{第3行乘3加到第1行} \\
 \text{第2行加到第1行} \\
 \longrightarrow \\
 \text{第2行乘}(-1)
 \end{array}$$

$$\begin{array}{ccccc}
 1 & 0 & 0 & 0 & 0 \\
 0 & 1 & 0 & 0 & \frac{37}{17} \\
 0 & 0 & 1 & 0 & -\frac{6}{17} \\
 0 & 0 & 0 & 1 & -\frac{16}{17}
 \end{array}
 \begin{array}{l}
 \\
 \\
 \\
 \end{array}, \text{相应的初等 } \gamma \text{ 阵为:}$$

$$P_1 = \begin{array}{ccccc}
 1 & -1 & 0 & 0 & 0 \\
 0 & 1 & 0 & 0 & 0 \\
 0 & 0 & 1 & 0 & 0 \\
 0 & 0 & 0 & 1 & 0
 \end{array}; P_2 = \begin{array}{ccccc}
 0 & 1 & 0 & 0 & 0 \\
 -2 & 1 & 0 & 0 & 0 \\
 0 & 0 & 1 & 0 & 0 \\
 0 & 0 & 0 & 1 & 0
 \end{array};$$



习题1.4($P_{39} - P_{41}$)

$$\begin{aligned}
 P_3 &= \begin{pmatrix} 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ -2 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}; P_4 = \begin{pmatrix} 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ -2 & 0 & 0 & 0 & 1 \end{pmatrix}; \\
 P_5 &= \begin{pmatrix} 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & -2 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}; P_6 = \begin{pmatrix} 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 1 & 1 \end{pmatrix};
 \end{aligned}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{aligned}
 P_3 &= \begin{pmatrix} 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ -2 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}; P_4 = \begin{pmatrix} 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ -2 & 0 & 0 & 0 & 1 \end{pmatrix}; \\
 P_5 &= \begin{pmatrix} 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & -2 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}; P_6 = \begin{pmatrix} 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 1 & 1 \end{pmatrix}; \\
 P_7 &= \begin{pmatrix} 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 3 \end{pmatrix};
 \end{aligned}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{aligned}
 P_3 &= \begin{pmatrix} 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ -2 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}; P_4 = \begin{pmatrix} 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ -2 & 0 & 0 & 0 & 1 \end{pmatrix}; \\
 P_5 &= \begin{pmatrix} 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & -2 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}; P_6 = \begin{pmatrix} 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}; \\
 P_7 &= \begin{pmatrix} 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 3 \end{pmatrix}; P_8 = \begin{pmatrix} 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 4 & 1 & 0 \end{pmatrix};
 \end{aligned}$$



习题1.4($P_{39} - P_{41}$)

$$P_9 = \begin{pmatrix} 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 0 \end{pmatrix};$$



习题1.4($P_{39} - P_{41}$)

$$P_9 = \begin{array}{cccc} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{array}; P_{10} = \begin{array}{cccc} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 1 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{aligned}
 P_9 &= \begin{pmatrix} 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}; P_{10} = \begin{pmatrix} 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 & 1 \end{pmatrix}; \\
 P_{11} &= \begin{pmatrix} 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & -\frac{1}{51} & 1 \end{pmatrix};
 \end{aligned}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{aligned}
 P_9 &= \begin{pmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 \end{pmatrix}; P_{10} = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix}; \\
 P_{11} &= \begin{pmatrix} 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix}; P_{12} = \begin{pmatrix} 0 & 0 & 1 & 1 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & -6 \end{pmatrix}; \\
 &\quad \begin{pmatrix} 0 & 0 & 0 & -\frac{1}{51} \\ 0 & 0 & 0 & 1 \end{pmatrix}
 \end{aligned}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{aligned}
 P_9 &= \begin{array}{cccc} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{array} \begin{array}{c} \textcircled{0} \\ \textcircled{1} \\ \textcircled{0} \\ \textcircled{1} \end{array}; P_{10} = \begin{array}{cccc} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{array} \begin{array}{c} \textcircled{0} \\ \textcircled{1} \\ \textcircled{0} \\ \textcircled{1} \end{array}; \\
 P_{11} &= \begin{array}{cccc} 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{array} \begin{array}{c} \textcircled{0} \\ \textcircled{1} \\ \textcircled{0} \\ \textcircled{1} \end{array}; P_{12} = \begin{array}{cccc} 0 & 0 & 1 & 1 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & -6 \end{array} \begin{array}{c} \textcircled{0} \\ \textcircled{1} \\ \textcircled{0} \\ \textcircled{1} \end{array}; \\
 P_{13} &= \begin{array}{cccc} 0 & 0 & 0 & -\frac{1}{51} \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & -12 \\ 0 & 0 & 1 & 0 \end{array} \begin{array}{c} \textcircled{0} \\ \textcircled{1} \\ \textcircled{0} \\ \textcircled{1} \end{array}; \\
 &\quad \begin{array}{cccc} 0 & 0 & 0 & 1 \end{array}
 \end{aligned}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{aligned}
 P_9 &= \begin{pmatrix} 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}; P_{10} = \begin{pmatrix} 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}; \\
 P_{11} &= \begin{pmatrix} 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}; P_{12} = \begin{pmatrix} 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & -6 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}; \\
 P_{13} &= \begin{pmatrix} 0 & 1 & 0 & 0 & -\frac{1}{51} \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}; P_{14} = \begin{pmatrix} 0 & 1 & 0 & 0 & 4 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix};
 \end{aligned}$$



习题1.4($P_{39} - P_{41}$)

$$P_{15} = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & -10 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix};$$



习题1.4($P_{39} - P_{41}$)

$$P_{15} = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & -10 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}; P_{16} = \begin{pmatrix} 0 & 1 & 0 & 3 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix};$$



习题1.4($P_{39} - P_{41}$)

$$\begin{aligned}
 P_{15} &= \begin{pmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & -10 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix}; P_{16} = \begin{pmatrix} 0 & 1 & 0 & 3 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix}; \\
 P_{17} &= \begin{pmatrix} 0 & 0 & 0 & 1 \\ 1 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix}; \\
 &\quad \begin{pmatrix} 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 \end{pmatrix}
 \end{aligned}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{aligned}
 P_{15} &= \begin{pmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & -10 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix}; P_{16} = \begin{pmatrix} 0 & 1 & 0 & 3 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix}; \\
 P_{17} &= \begin{pmatrix} 0 & 0 & 0 & 1 \\ 1 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix}; P_{18} = \begin{pmatrix} 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix}; \\
 &\quad \begin{pmatrix} 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 \end{pmatrix}
 \end{aligned}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{aligned}
 P_{15} &= \begin{pmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & -10 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix}; P_{16} = \begin{pmatrix} 0 & 1 & 0 & 3 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix}; \\
 P_{17} &= \begin{pmatrix} 0 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix}; P_{18} = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix}; \\
 &\quad \begin{pmatrix} 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 \end{pmatrix}
 \end{aligned}$$

2.)



习题1.4($P_{39} - P_{41}$)

$$\begin{aligned}
 P_{15} &= \begin{pmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & -10 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix}; P_{16} = \begin{pmatrix} 0 & 1 & 0 & 3 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix}; \\
 P_{17} &= \begin{pmatrix} 0 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix}; P_{18} = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix}; \\
 &\quad \begin{pmatrix} 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 \end{pmatrix}
 \end{aligned}$$

2.)

$$\begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & -1 \\ 1 & 3 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 2 & 1 \end{pmatrix}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{aligned}
 P_{15} &= \begin{pmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & -10 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix} \begin{matrix} C \\ C \\ C \\ A \end{matrix}; P_{16} = \begin{pmatrix} 0 & 1 & 0 & 3 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix} \begin{matrix} C \\ C \\ C \\ A \end{matrix}; \\
 P_{17} &= \begin{pmatrix} 0 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix} \begin{matrix} C \\ C \\ C \\ A \end{matrix}; P_{18} = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix} \begin{matrix} C \\ C \\ C \\ A \end{matrix}; \\
 &\quad \begin{pmatrix} 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 \end{pmatrix}
 \end{aligned}$$

2.)

$$\begin{array}{ccc}
 0 & & 1 \\
 1 & 0 & -1 \\
 B & & C \\
 @1 & 3 & 0 \\
 A & & A
 \end{array} \begin{array}{l} \text{第1行乘(-1)加到第2行} \\ \text{第3行乘(-1)加到第2行} \\ \longrightarrow \\ \text{第2行乘(-2)加到第3行} \end{array}$$

第3行加到第1行



习题1.4($P_{39} - P_{41}$)

$$\begin{aligned}
 P_{15} &= \begin{pmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & -10 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix}; P_{16} = \begin{pmatrix} 0 & 1 & 0 & 3 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix}; \\
 P_{17} &= \begin{pmatrix} 0 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix}; P_{18} = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix}; \\
 &\quad \begin{pmatrix} 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 \end{pmatrix}
 \end{aligned}$$

2.)

$$\begin{aligned}
 &\begin{pmatrix} 0 & 1 & 0 & -1 \\ 1 & 3 & 0 & 1 \\ 0 & 2 & 1 & 0 \end{pmatrix} \xrightarrow{\begin{array}{l} \text{第1行乘(-1)加到第2行} \\ \text{第3行乘(-1)加到第2行} \\ \text{第2行乘(-2)加到第3行} \end{array}} \begin{pmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{pmatrix} \\
 &\text{第3行加到第1行}
 \end{aligned}$$

第3行加到第1行

习题1.4($P_{39} - P_{41}$)

相应的初等Y阵为

$$P_1 = \begin{pmatrix} 1 & 0 & 0 \\ -1 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix};$$



习题1.4($P_{39} - P_{41}$)相应的初等 γ 阵为

$$P_1 = \begin{pmatrix} 1 & 0 & 0 \\ 0 & -1 & 1 \\ 0 & 0 & 1 \end{pmatrix}; P_2 = \begin{pmatrix} 0 & 1 & 0 \\ 0 & 1 & -1 \\ 0 & 0 & 1 \end{pmatrix}$$



习题1.4($P_{39} - P_{41}$)

相应的初等Y阵为

$$P_1 = \begin{pmatrix} 1 & 0 & 0 \\ 0 & -1 & 1 \\ 0 & 0 & 1 \end{pmatrix}; P_2 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & -1 \\ 0 & 0 & 1 \end{pmatrix};$$

$$P_3 = \begin{pmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{pmatrix};$$

$$\begin{pmatrix} 0 & -2 & 1 \end{pmatrix}$$



习题1.4($P_{39} - P_{41}$)

相应的初等Y阵为

$$P_1 = \begin{pmatrix} 1 & 0 & 0 \\ 0 & -1 & 1 \\ 0 & 1 & 0 \end{pmatrix}; P_2 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & -1 \\ 0 & 1 & 1 \end{pmatrix};$$

$$P_3 = \begin{pmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{pmatrix}; P_4 = \begin{pmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 0 & -2 & 1 \end{pmatrix};$$

满足 $P_4 P_3 P_2 P_1 A$ 为规范 梯形Y阵.



习题1.4($P_{39} - P_{41}$)

相应的初等Y阵为

$$P_1 = \begin{pmatrix} 1 & 0 & 0 \\ 0 & -1 & 1 \\ 0 & 1 & 0 \end{pmatrix}; P_2 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & -1 \\ 0 & 1 & 1 \end{pmatrix};$$

$$P_3 = \begin{pmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{pmatrix}; P_4 = \begin{pmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 0 & 1 & 0 \end{pmatrix};$$

$$\begin{pmatrix} 0 & -2 & 1 \\ 0 & 0 & 1 \end{pmatrix}$$

满足 $P_4 P_3 P_2 P_1 A$ 为规范 梯形Y阵.

3.)



习题1.4($P_{39} - P_{41}$)

相应的初等Y阵为

$$P_1 = \begin{pmatrix} 1 & 0 & 0 \\ 0 & -1 & 1 \\ 0 & 1 & 0 \end{pmatrix}; P_2 = \begin{pmatrix} 0 & 1 & 0 \\ 0 & 1 & -1 \\ 0 & 0 & 1 \end{pmatrix};$$

$$P_3 = \begin{pmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{pmatrix}; P_4 = \begin{pmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 0 & -2 & 1 \end{pmatrix};$$

满足 $P_4 P_3 P_2 P_1 A$ 为规范Y阵.

$$3.) \text{ 记 } P_1 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix};$$



习题1.4($P_{39} - P_{41}$)

相应的初等Y阵为

$$P_1 = \begin{pmatrix} 1 & 0 & 0 \\ 0 & -1 & 1 \\ 0 & 0 & 0 \end{pmatrix}; P_2 = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & -1 \\ 0 & 0 & 1 \end{pmatrix};$$

$$P_3 = \begin{pmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{pmatrix}; P_4 = \begin{pmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix};$$

满足 $P_4 P_3 P_2 P_1 A$ 为规范梯形Y阵.

$$3.) \text{ 记 } P_1 = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}; P_2 = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 1 & 1 \end{pmatrix}, K$$



习题1.4($P_{39} - P_{41}$)

相应的初等Y阵为

$$P_1 = \begin{pmatrix} 1 & 0 & 0 \\ 0 & -1 & 1 \\ 0 & 1 & 0 \end{pmatrix}; P_2 = \begin{pmatrix} 0 & 1 & 0 \\ 0 & 1 & -1 \\ 0 & 0 & 1 \end{pmatrix};$$

$$P_3 = \begin{pmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{pmatrix}; P_4 = \begin{pmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 0 & 1 & 0 \end{pmatrix};$$

满足 $P_4 P_3 P_2 P_1 A$ 为规范梯形Y阵.

$$3.) \text{ 记 } P_1 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}; P_2 = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 1 & 1 \end{pmatrix}, K$$

$$P_1 A = B; P_2 B = C,$$



习题1.4($P_{39} - P_{41}$)

相应的初等Y阵为

$$P_1 = \begin{pmatrix} 1 & 0 & 0 \\ 0 & -1 & 1 \\ 0 & 1 & 0 \end{pmatrix}; P_2 = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & -1 \\ 0 & 0 & 1 \end{pmatrix};$$

$$P_3 = \begin{pmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{pmatrix}; P_4 = \begin{pmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 0 & -2 & 1 \end{pmatrix};$$

满足 $P_4 P_3 P_2 P_1 A$ 为规范梯形Y阵.3.) 记 $P_1 = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}; P_2 = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 1 & 1 \end{pmatrix}$, K

$$P_1 A = B; P_2 B = C, \quad \text{以 } P_2 P_1 A = C,$$



习题1.4($P_{39} - P_{41}$)

$$\text{取 } Q = P_2 P_1 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 1 & 0 & 1 \end{pmatrix} \begin{matrix} B \\ A \\ C \end{matrix},$$



习题1.4($P_{39} - P_{41}$)

$$\text{取 } Q = P_2 P_1 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 1 & 0 & 1 \end{pmatrix} A, \quad KQA = C.$$



习题1.4($P_{39} - P_{41}$)

$$\text{取 } Q = P_2 P_1 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 1 & 0 & 1 \end{pmatrix} A, \quad KQA = C.$$

4.(1))



习题1.4($P_{39} - P_{41}$)

$$\text{取 } Q = P_2 P_1 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 1 & 0 & 1 \end{pmatrix} \begin{matrix} B \\ A \\ C \end{matrix}, \quad KQA = C.$$

4.(1) 构造 $\dot{Y}$ 阵

$$(A \ I) =$$

$$\begin{pmatrix} 2 & 1 & 1 & 0 \\ 3 & 4 & 0 & 1 \end{pmatrix} \begin{matrix} \text{第1行乘}(\frac{1}{2}) \\ \text{第1行乘}(-3)\text{加到第2行} \\ \longrightarrow \\ \text{第2行乘}(\frac{2}{5}) \\ \text{第2行乘}(-\frac{1}{2})\text{加到第1行} \end{matrix}$$



习题1.4($P_{39} - P_{41}$)

$$\text{取 } Q = P_2 P_1 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 1 & 0 & 1 \end{pmatrix} \begin{matrix} B \\ A \\ C \end{matrix}, \quad KQA = C.$$

4.(1) 构造 $\dot{Y}$ 阵

$$(A \ I) =$$

$$\begin{array}{ccc|ccc} 2 & 1 & 1 & 0 & & & \\ 3 & 4 & 0 & 1 & & & \end{array} \begin{array}{l} \text{第1行乘}(\frac{1}{2}) \\ \text{第1行乘}(-3)\text{加到第2行} \\ \longrightarrow \\ \text{第2行乘}(\frac{2}{5}) \\ \text{第2行乘}(-\frac{1}{2})\text{加到第1行} \end{array} \begin{array}{ccc|ccc} 1 & 0 & \frac{4}{5} & -\frac{1}{5} & & & \\ 0 & 1 & -\frac{3}{5} & \frac{2}{5} & & & \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\text{取 } Q = P_2 P_1 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 1 & 0 & 1 \end{pmatrix} A, \quad KQA = C.$$

4.(1) 构造 Y 阵

$$(A \ I) =$$

$$\begin{array}{ccc} \begin{array}{ccc} \begin{array}{ccc} 2 & 1 & 1 & 0 \\ 3 & 4 & 0 & 1 \end{array} & \begin{array}{l} \text{第1行乘}(\frac{1}{2}) \\ \text{第1行乘}(-3)\text{加到第2行} \\ \text{第2行乘}(\frac{2}{5}) \\ \text{第2行乘}(-\frac{1}{2})\text{加到第1行} \end{array} & \begin{array}{ccc} 1 & 0 & \frac{4}{5} & -\frac{1}{5} \\ 0 & 1 & -\frac{3}{5} & \frac{2}{5} \end{array} \end{array} \\ \text{以 } \begin{array}{ccc} \begin{array}{ccc} 2 & 1 \\ 3 & 4 \end{array} & \begin{array}{l} \text{第1行乘}(-1) \\ \text{第2行乘}(-1) \end{array} & \begin{array}{ccc} \frac{4}{5} & -\frac{1}{5} \\ -\frac{3}{5} & \frac{2}{5} \end{array} \end{array} \end{array}$$



习题1.4($P_{39} - P_{41}$)

4.(2))



习题1.4($P_{39} - P_{41}$)4.(2)) 构造 $\dot{Y}$ 阵

$$(A \ I) = \begin{array}{c} \begin{array}{cccccc} 0 & & & & & 1 \\ & 2 & 2 & 3 & 1 & 0 & 0 \\ \textcircled{B} & 1 & -1 & 0 & 0 & 1 & 0 \\ & -1 & 2 & 1 & 0 & 0 & 1 \end{array} \end{array} \begin{array}{c} \\ \\ \textcircled{C} \\ \textcircled{A} \end{array}$$





习题1.4($P_{39} - P_{41}$)4.(2)) 构造 $\dot{Y}$ 阵

$$(A \ I) = \begin{array}{ccccccc} 0 & & & & & & 1 \\ & 2 & 2 & 3 & 1 & 0 & 0 \\ \textcircled{B} & 1 & -1 & 0 & 0 & 1 & 0 \\ & -1 & 2 & 1 & 0 & 0 & 1 \end{array} \begin{array}{l} \textcircled{C} \\ \textcircled{A} \end{array}$$

换1、2行
第1行乘(-2)加到第2行
→
第1行加到第3行

$$\begin{array}{ccccccc} 0 & & & & & & 1 \\ 1 & -1 & 0 & 0 & 1 & 0 & \\ \textcircled{B} & 0 & 4 & 3 & 1 & -2 & 0 \\ \textcircled{A} & 0 & 1 & 1 & 0 & 1 & 1 \end{array}$$





习题1.4($P_{39} - P_{41}$)4.(2)) 构造 $\dot{Y}$ 阵

$$(A \ I) = \begin{array}{cccccc|c} 0 & 2 & 2 & 3 & 1 & 0 & 0 & 1 \\ \text{B} & 1 & -1 & 0 & 0 & 1 & 0 & \text{C} \\ \text{A} & -1 & 2 & 1 & 0 & 0 & 1 & \end{array}$$

换1、2行
第1行乘(-2)加到第2行
→
第1行加到第3行

$$\begin{array}{cccccc|c} 0 & 1 & -1 & 0 & 0 & 1 & 0 & 1 \\ \text{B} & 0 & 4 & 3 & 1 & -2 & 0 & \text{C} \\ \text{A} & 0 & 1 & 1 & 0 & 1 & 1 & \end{array}$$

换2、3行
第2行乘(-4)加到第3行
→
第3行加到第2行

$$\begin{array}{cccccc|c} 0 & 1 & -1 & 0 & 0 & 1 & 0 & 1 \\ \text{B} & 0 & 1 & 0 & 1 & -5 & -3 & \text{C} \\ \text{A} & 0 & 0 & -1 & 1 & -6 & -4 & \end{array}$$





习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccccc}
 & 0 & & & & 1 \\
 & 1 & 0 & 0 & 1 & -4 & -3 \\
 \text{B} & 0 & 1 & 0 & 1 & -5 & -3 \\
 @ & 0 & 1 & 0 & 1 & -5 & -3 \\
 & 0 & 0 & 1 & -1 & 6 & 4
 \end{array} \text{C} \text{A}.$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccccc}
 0 & & & & & 1 \\
 1 & 0 & 0 & 1 & -4 & -3 \\
 \text{B} & & & & & \text{C} \\
 @0 & 1 & 0 & 1 & -5 & -3 \text{A.} \\
 0 & 0 & 1 & -1 & 6 & 4 \\
 0 & & & & 1 & -1 & 0 & & 1 \\
 & 2 & 2 & 3 & & & 1 & -4 & -3 \\
 \text{以B} & & & & & & & & \\
 @1 & -1 & 0 & \text{C} & = & \text{B} & & & \text{C} \\
 & & & \text{A} & & @1 & -5 & -3 \text{A.} \\
 & -1 & 2 & 1 & & & -1 & 6 & 4
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{ccccccc}
 & 0 & & & & & 1 \\
 & 1 & 0 & 0 & 1 & -4 & -3 \\
 \text{B} & 0 & 1 & 0 & 1 & -5 & -3 \\
 @ & 0 & 1 & 0 & 1 & -5 & -3 \\
 & 0 & 0 & 1 & -1 & 6 & 4 \\
 & 0 & & & & 1 & -1 \\
 & & 2 & 2 & 3 & & 0 \\
 & & & & & & 1 \\
 \text{以B} & 1 & -1 & 0 & 1 & -4 & -3 \\
 @ & 1 & -1 & 0 & 1 & -5 & -3 \\
 & -1 & 2 & 1 & & -1 & 6 & 4
 \end{array}$$

4.(3))



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccccc}
 0 & & & & & 1 \\
 1 & 0 & 0 & 1 & -4 & -3 \\
 \text{B} & & & & & \text{C} \\
 @0 & 1 & 0 & 1 & -5 & -3 \text{A.} \\
 0 & 0 & 1 & -1 & 6 & 4 \\
 0 & & & & 1 & -1 & 0 & & 1 \\
 & 2 & 2 & 3 & & & 1 & -4 & -3 \\
 \text{以B} & & & & & & \text{C} & & \\
 @1 & -1 & 0 & \text{A} & = & @1 & -5 & -3 \text{A.} \\
 & -1 & 2 & 1 & & -1 & 6 & 4
 \end{array}$$

4.(3)) 构作 $\dot{Y}$ 阵

$$\begin{array}{cccccc}
 0 & & & & & 1 \\
 1 & 0 & 0 & 1 & 0 & 0 \\
 \text{B} & & & & & \text{C} \\
 (A \ I) = @1 & 2 & 0 & 0 & 1 & 0 \text{A} \\
 & 1 & 2 & 3 & 0 & 0 & 1
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccccc}
 0 & & & & & 1 \\
 1 & 0 & 0 & 1 & -4 & -3 \\
 \text{B} & & & & & \text{C} \\
 @0 & 1 & 0 & 1 & -5 & -3 \text{A} \\
 0 & 0 & 1 & -1 & 6 & 4 \\
 0 & & & 1 & -1 & 0 \\
 & 2 & 2 & 3 & & 1 \\
 \text{以B} & 1 & -1 & 0 & \text{C} & = \text{B} \\
 @ & 1 & -5 & -3 & \text{A} & \\
 & -1 & 2 & 1 & -1 & 6 & 4
 \end{array}$$

4.(3)) 构造 $\dot{Y}$ 阵

$$\begin{array}{cccccc}
 0 & & & & & 1 \\
 1 & 0 & 0 & 1 & 0 & 0 \\
 \text{B} & & & & & \text{C} \\
 @1 & 2 & 0 & 0 & 1 & 0 \text{A} \\
 1 & 2 & 3 & 0 & 0 & 1
 \end{array}$$

第1行乘(-1)加到第2行
 第1行乘(-1)加到第3行
 →
 第2行乘(-1)加到第3行



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccccc}
 & 0 & & & & 1 \\
 & 1 & 0 & 0 & 1 & 0 & 0 \\
 \begin{array}{c} B \\ @ \end{array} & 0 & 2 & 0 & -1 & 1 & 0 \\
 & 0 & 0 & 3 & 0 & -1 & 1
 \end{array}
 \begin{array}{c} \\ \\ C \\ A \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccccc}
 0 & & & & & 1 \\
 1 & 0 & 0 & 1 & 0 & 0 \\
 0 & 2 & 0 & -1 & 1 & 0 \\
 0 & 0 & 3 & 0 & -1 & 1
 \end{array}
 \begin{array}{l}
 \\
 \\
 \xrightarrow{\quad} \\
 \\
 \end{array}
 \begin{array}{l}
 \\
 \text{第2行乘 } \frac{1}{2} \text{ 加到第2行} \\
 \\
 \text{第3行乘 } \frac{1}{3} \text{ 加到第3行}
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccccc}
 0 & & & & & 1 \\
 1 & 0 & 0 & 1 & 0 & 0 \\
 0 & 2 & 0 & -1 & 1 & 0 \\
 0 & 0 & 3 & 0 & -1 & 1 \\
 1 & 0 & 0 & 1 & 0 & 0 \\
 0 & 1 & 0 & -\frac{1}{2} & \frac{1}{2} & 0 \\
 0 & 0 & 1 & 0 & -\frac{1}{3} & \frac{1}{3}
 \end{array}
 \begin{array}{l}
 \text{C} \\
 \text{A} \\
 \text{A} \\
 \text{A} \\
 \text{C} \\
 \text{A} \\
 \text{A}
 \end{array}
 \begin{array}{l}
 \text{第2行乘}\frac{1}{2}\text{加到第2行} \\
 \longrightarrow \\
 \text{第3行乘}\frac{1}{3}\text{加到第3行}
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccccc}
 0 & & & & & 1 \\
 1 & 0 & 0 & 1 & 0 & 0 \\
 0 & 2 & 0 & -1 & 1 & 0 \\
 0 & 0 & 3 & 0 & -1 & 1 \\
 1 & 0 & 0 & 1 & 0 & 0 \\
 0 & 1 & 0 & -\frac{1}{2} & \frac{1}{2} & 0 \\
 0 & 0 & 1 & 0 & -\frac{1}{3} & \frac{1}{3} \\
 0 & 1 & 0 & 0 & 1 & -1 \\
 1 & 2 & 0 & 1 & 0 & 0 \\
 1 & 2 & 3 & 0 & -\frac{1}{3} & \frac{1}{3}
 \end{array}
 \begin{array}{l}
 \text{第2行乘}\frac{1}{2}\text{加到第2行} \\
 \longrightarrow \\
 \text{第3行乘}\frac{1}{3}\text{加到第3行} \\
 \text{以B@} \\
 \text{C} \\
 \text{A} \\
 \text{C} \\
 \text{A} \\
 \text{C} \\
 \text{A} \\
 \text{C} \\
 \text{A}
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

4.(4))



习题1.4($P_{39} - P_{41}$)4.(4)) 构造 $\hat{Y}$ 阵

$$(A \ I) = \begin{pmatrix} 1 & 2 & 3 & 4 & 1 & 0 & 0 & 0 \\ 0 & 1 & 2 & 3 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 2 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 & 1 \end{pmatrix}$$

第4行乘(-2)加到第3行

第4行乘(-3)加到第2行

第4行乘(-4)加到第1行



习题1.4($P_{39} - P_{41}$)4.(4)) 构造 $\dot{Y}$ 阵

$$(A \ I) = \begin{pmatrix} 1 & 2 & 3 & 4 & 1 & 0 & 0 & 0 \\ 0 & 1 & 2 & 3 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 2 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 & 1 \end{pmatrix} \begin{matrix} 1 \\ C \\ C \\ C \\ C \\ A \end{matrix}$$

第4行乘(-2)加到第3行
第4行乘(-3)加到第2行
→
第4行乘(-4)加到第1行

$$\begin{pmatrix} 1 & 2 & 3 & 0 & 1 & 0 & 0 & -4 \\ 0 & 1 & 2 & 0 & 0 & 1 & 0 & -3 \\ 0 & 0 & 1 & 0 & 0 & 0 & 1 & -2 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 & 1 \end{pmatrix} \begin{matrix} C \\ C \\ C \\ A \end{matrix}$$



习题1.4($P_{39} - P_{41}$)4.(4)) 构造 $\dot{Y}$ 阵

$$\begin{array}{cccccccc|l}
 & 1 & 2 & 3 & 4 & 1 & 0 & 0 & 0 & \text{第4行乘(-2)加到第3行} \\
 (A \ I) = & 0 & 1 & 2 & 3 & 0 & 1 & 0 & 0 & \text{第4行乘(-3)加到第2行} \\
 @ & 0 & 0 & 1 & 2 & 0 & 0 & 1 & 0 & \longrightarrow \\
 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 1 & \text{第4行乘(-4)加到第1行} \\
 0 & & & & & & & & & \\
 & 1 & 2 & 3 & 0 & 1 & 0 & 0 & -4 & \text{第3行乘(-2)加到第2行} \\
 @ & 0 & 1 & 2 & 0 & 0 & 1 & 0 & -3 & \text{第3行乘(-3)加到第1行} \\
 @ & 0 & 0 & 1 & 0 & 0 & 0 & 1 & -2 & \longrightarrow \\
 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 1 & \text{第2行乘(-2)加到第1行}
 \end{array}$$



习题1.4($P_{39} - P_{41}$)4.(4)) 构造 $\hat{Y}$ 阵

$$\begin{aligned}
 (A \ I) &= \begin{pmatrix} 1 & 2 & 3 & 4 & 1 & 0 & 0 & 0 \\ 0 & 1 & 2 & 3 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 2 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 & 1 \end{pmatrix} \begin{matrix} 1 \\ 0 \\ 0 \\ 0 \end{matrix} \\
 &\quad \begin{matrix} \text{第4行乘}(-2)\text{加到第3行} \\ \text{第4行乘}(-3)\text{加到第2行} \\ \longrightarrow \\ \text{第4行乘}(-4)\text{加到第1行} \end{matrix} \\
 &\quad \begin{pmatrix} 1 & 2 & 3 & 0 & 1 & 0 & 0 & -4 \\ 0 & 1 & 2 & 0 & 0 & 1 & 0 & -3 \\ 0 & 0 & 1 & 0 & 0 & 0 & 1 & -2 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 & 1 \end{pmatrix} \begin{matrix} 1 \\ 0 \\ 0 \\ 0 \end{matrix} \\
 &\quad \begin{matrix} \text{第3行乘}(-2)\text{加到第2行} \\ \text{第3行乘}(-3)\text{加到第1行} \\ \longrightarrow \\ \text{第2行乘}(-2)\text{加到第1行} \end{matrix} \\
 &\quad \begin{pmatrix} 1 & 0 & 0 & 0 & 1 & -2 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 & 1 & -2 & 1 \\ 0 & 0 & 1 & 0 & 0 & 0 & 1 & -2 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 & 1 \end{pmatrix} \begin{matrix} 1 \\ 0 \\ 0 \\ 0 \end{matrix}
 \end{aligned}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccc} 0 & 1 & 0 & 1 \\ 1 & 2 & 1 & -2 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{array} \begin{array}{c} 1 \\ -1 \\ 0 \\ 0 \\ 0 \end{array} = \begin{array}{cccc} 1 & -2 & 1 & 0 \\ 0 & 1 & -2 & 1 \\ 0 & 0 & 1 & -2 \\ 0 & 0 & 0 & 1 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccc} 0 & 1 & -1 & 0 \\ 1 & 2 & 3 & 4 \\ \text{以} \begin{array}{c} \text{0} \\ \text{0} \\ \text{0} \\ \text{0} \\ \text{0} \end{array} & \begin{array}{c} 1 \\ 2 \\ 3 \\ 4 \\ 5 \end{array} & \begin{array}{c} 2 \\ 3 \\ 4 \\ 5 \\ 6 \end{array} & \begin{array}{c} 3 \\ 4 \\ 5 \\ 6 \\ 7 \end{array} \\ @ & & & A \\ 0 & 0 & 1 & 2 \\ 0 & 0 & 0 & 1 \end{array} = \begin{array}{cccc} 1 & -2 & 1 & 0 \\ 0 & 1 & -2 & 1 \\ 0 & 0 & 1 & -2 \\ 0 & 0 & 0 & 1 \end{array} \begin{array}{c} \text{0} \\ \text{0} \\ \text{0} \\ \text{0} \\ \text{0} \end{array} \begin{array}{c} 1 \\ 2 \\ 3 \\ 4 \\ 5 \end{array} \begin{array}{c} 2 \\ 3 \\ 4 \\ 5 \\ 6 \end{array} \begin{array}{c} 3 \\ 4 \\ 5 \\ 6 \\ 7 \end{array}$$

4.(5))

习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccc|cccc}
 0 & & & & 1 & -1 & 0 & & 1 \\
 1 & 2 & 3 & 4 & & & & & \\
 0 & 1 & 2 & 3 & & & & & \\
 0 & 0 & 1 & 2 & & & & & \\
 0 & 0 & 0 & 1 & & & & &
 \end{array}
 =
 \begin{array}{cccc|cccc}
 1 & -2 & 1 & 0 & & & & \\
 0 & 1 & -2 & 1 & & & & \\
 0 & 0 & 1 & -2 & & & & \\
 0 & 0 & 0 & 1 & & & &
 \end{array}$$

4.(5)) 构造 $\hat{Y}$ 阵

$$\begin{array}{cccc|cccc}
 2 & 1 & 0 & 0 & 1 & 0 & 0 & 0 \\
 1 & 1 & 0 & 0 & 0 & 1 & 0 & 0 \\
 0 & 0 & 2 & 5 & 0 & 0 & 1 & 0 \\
 0 & 0 & 1 & 3 & 0 & 0 & 0 & 1
 \end{array}
 \begin{array}{l}
 \text{第2行乘}(-1)\text{加到第1行} \\
 \longrightarrow \\
 \text{第1行乘}(-1)\text{加到第2行} \\
 \longrightarrow \\
 \text{第4行乘}(-1)\text{加到第3行} \\
 \text{第3行乘}(-1)\text{加到第4行} \\
 \longrightarrow \\
 \text{第4行乘}(-2)\text{加到第3行}
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccccccc}
 0 & & & & & & & 1 \\
 1 & 0 & 0 & 0 & 1 & -1 & 0 & 0 \\
 0 & 1 & 0 & 0 & -1 & 2 & 0 & 0 \\
 0 & 0 & 1 & 0 & 0 & 0 & 3 & -5 \\
 0 & 0 & 0 & 1 & 0 & 0 & -1 & 2
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{ccccccccc}
 0 & & & & & & & & 1 \\
 1 & 0 & 0 & 0 & 1 & -1 & 0 & 0 & \\
 0 & 1 & 0 & 0 & -1 & 2 & 0 & 0 & \\
 0 & 0 & 1 & 0 & 0 & 0 & 3 & -5 & \\
 0 & 0 & 0 & 1 & 0 & 0 & -1 & 2 & \\
 0 & 2 & 1 & 0 & 0 & 1 & -1 & 0 & 1 \\
 1 & 1 & 0 & 0 & 0 & 1 & -1 & 0 & 0 \\
 0 & 0 & 2 & 5 & 0 & 0 & 0 & 3 & -5 \\
 0 & 0 & 1 & 3 & 0 & 0 & -1 & 2 &
 \end{array}
 =
 \begin{array}{ccccccccc}
 1 & -1 & 0 & 0 & 1 \\
 -1 & 2 & 0 & 0 & 0 \\
 0 & 0 & 3 & -5 & 0 \\
 0 & 0 & -1 & 2 &
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{ccccccccc}
 0 & & & & & & & & 1 \\
 1 & 0 & 0 & 0 & 1 & -1 & 0 & 0 & \\
 0 & 1 & 0 & 0 & -1 & 2 & 0 & 0 & \\
 0 & 0 & 1 & 0 & 0 & 0 & 3 & -5 & \\
 0 & 0 & 0 & 1 & 0 & 0 & -1 & 2 & \\
 0 & 2 & 1 & 0 & 0 & 1 & -1 & 0 & 1 \\
 1 & 1 & 0 & 0 & & & & & \\
 0 & 0 & 2 & 5 & & & & & \\
 0 & 0 & 1 & 3 & & & & &
 \end{array}
 =
 \begin{array}{ccccccccc}
 1 & -1 & 0 & 0 & & & & & 1 \\
 -1 & 2 & 0 & 0 & & & & & \\
 0 & 0 & 3 & -5 & & & & & \\
 0 & 0 & -1 & 2 & & & & &
 \end{array}$$

5.(1))



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{ccccccccc}
 0 & & & & & & & & 1 \\
 1 & 0 & 0 & 0 & 1 & -1 & 0 & 0 & \\
 0 & 1 & 0 & 0 & -1 & 2 & 0 & 0 & \\
 0 & 0 & 1 & 0 & 0 & 0 & 3 & -5 & \\
 0 & 0 & 0 & 1 & 0 & 0 & -1 & 2 & \\
 0 & 2 & 1 & 0 & 0 & 1 & -1 & 0 & 1 \\
 1 & 1 & 0 & 0 & 0 & 1 & -1 & 0 & 0 \\
 0 & 0 & 2 & 5 & 0 & 0 & 0 & 3 & -5 \\
 0 & 0 & 1 & 3 & 0 & 0 & -1 & 2 &
 \end{array}$$

以

$$\begin{array}{cccc}
 1 & -1 & 0 & 0 \\
 -1 & 2 & 0 & 0 \\
 0 & 0 & 3 & -5 \\
 0 & 0 & -1 & 2
 \end{array}$$

5.(1)) 因为

$$\begin{array}{cc}
 1 & -1 \\
 1 & 1
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{ccccccccc}
 0 & & & & & & & & 1 \\
 1 & 0 & 0 & 0 & 1 & -1 & 0 & 0 & \\
 0 & 1 & 0 & 0 & -1 & 2 & 0 & 0 & \\
 0 & 0 & 1 & 0 & 0 & 0 & 3 & -5 & \\
 0 & 0 & 0 & 1 & 0 & 0 & -1 & 2 & \\
 0 & 0 & 0 & 0 & 1 & -1 & 0 & 0 & 1 \\
 2 & 1 & 0 & 0 & & & 1 & -1 & 0 & 0 \\
 1 & 1 & 0 & 0 & & & -1 & 2 & 0 & 0 \\
 0 & 0 & 2 & 5 & & & 0 & 0 & 3 & -5 \\
 0 & 0 & 1 & 3 & & & 0 & 0 & -1 & 2
 \end{array}$$

以

$$\begin{array}{ccccccccc}
 1 & -1 & 0 & 0 & & & & & & \\
 1 & 1 & 0 & 0 & & & & & & \\
 0 & 0 & 2 & 5 & & & & & & \\
 0 & 0 & 1 & 3 & & & & & &
 \end{array}
 =
 \begin{array}{ccccccccc}
 1 & -1 & 0 & 0 & & & & & & \\
 -1 & 2 & 0 & 0 & & & & & & \\
 0 & 0 & 3 & -5 & & & & & & \\
 0 & 0 & -1 & 2 & & & & & &
 \end{array}$$

5.(1)) 因为

! 第1行乘(-1)加到第2行

1 -1 第2行乘 $\frac{1}{2}$ 1 1 $\longrightarrow$

第2行加到第1行



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{ccccccccc}
 0 & & & & & & & & 1 \\
 1 & 0 & 0 & 0 & 1 & -1 & 0 & 0 & \\
 0 & 1 & 0 & 0 & -1 & 2 & 0 & 0 & \\
 0 & 0 & 1 & 0 & 0 & 0 & 3 & -5 & \\
 0 & 0 & 0 & 1 & 0 & 0 & -1 & 2 & \\
 0 & 0 & 0 & 0 & 1 & -1 & 0 & 0 & 1 \\
 2 & 1 & 0 & 0 & & & 1 & -1 & 0 & 0 \\
 1 & 1 & 0 & 0 & & & -1 & 2 & 0 & 0 \\
 0 & 0 & 2 & 5 & & & 0 & 0 & 3 & -5 \\
 0 & 0 & 1 & 3 & & & 0 & 0 & -1 & 2
 \end{array}$$

以

$$\begin{array}{ccccccccc}
 1 & -1 & & & & & & & \\
 1 & 0 & & & & & & & \\
 0 & 1 & & & & & & & \\
 & & & & & & & &
 \end{array}$$

5.(1)) 因为

$$\begin{array}{ccc}
 \begin{array}{cc} 1 & -1 \\ 1 & 1 \end{array} & \begin{array}{l} \text{第1行乘(-1)加到第2行} \\ \text{第2行乘}\frac{1}{2} \end{array} & \begin{array}{cc} 1 & 0 \\ 0 & 1 \end{array} \\
 \longrightarrow & &
 \end{array}$$

第2行加到第1行



习题1.4($P_{39} - P_{41}$)

$$\text{以} \begin{pmatrix} 1 & 1 & 1 & 0 & 1 & 0 & 1 & -1 \\ 0 & 1 & 0 & \frac{1}{2} & -1 & 1 & 1 & 1 \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix},$$



习题1.4($P_{39} - P_{41}$)

$$\begin{aligned}
 & \text{以 } \begin{pmatrix} 1 & 1 & 1 & 0 & 1 & 0 & 1 & -1 \\ 0 & 1 & 0 & \frac{1}{2} & -1 & 1 & 1 & 1 \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}, \\
 & \text{以 } \begin{pmatrix} 1 & -1 & 1 & 0 & 1 & 0 & 1 & -1 \\ 1 & 1 & 1 & 1 & 0 & 2 & 0 & 1 \end{pmatrix}.
 \end{aligned}$$



习题1.4($P_{39} - P_{41}$)

$$\text{以 } \begin{pmatrix} 1 & 1 & 1 & 0 & 1 & 0 & 1 & -1 \\ 0 & 1 & 0 & \frac{1}{2} & -1 & 1 & 1 & 1 \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix},$$

$$\text{以 } \begin{pmatrix} 1 & -1 \\ 1 & 1 \end{pmatrix} = \begin{pmatrix} 1 & 0 & 1 & 0 & 1 & -1 \\ 1 & 1 & 0 & 2 & 0 & 1 \end{pmatrix}.$$

5.(2)



习题1.4($P_{39} - P_{41}$)

$$\text{以 } \begin{pmatrix} 1 & 1 & 1 & 0 & 1 & 0 & 1 & -1 & 1 & 0 \\ 0 & 1 & 0 & \frac{1}{2} & -1 & 1 & 1 & 1 & 0 & 1 \end{pmatrix} =$$

$$\text{以 } \begin{pmatrix} 1 & -1 & 1 & 0 & 1 & 0 & 1 & -1 \\ 1 & 1 & 1 & 1 & 0 & 2 & 0 & 1 \end{pmatrix}.$$

5.(2)) 因为

$$\begin{pmatrix} 0 & 1 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{pmatrix} \begin{matrix} B \\ C \\ A \end{matrix}$$



习题1.4($P_{39} - P_{41}$)

$$\text{以 } \begin{pmatrix} 1 & 1 & 1 & 0 & 1 & 0 & 1 & -1 & 1 & 0 \\ 0 & 1 & 0 & \frac{1}{2} & -1 & 1 & 1 & 1 & 0 & 1 \end{pmatrix} =$$

$$\text{以 } \begin{pmatrix} 1 & -1 & 1 & 0 & 1 & 0 & 1 & -1 \\ 1 & 1 & 1 & 1 & 0 & 2 & 0 & 1 \end{pmatrix}.$$

5.(2)) 因为

 $\begin{pmatrix} 0 & 1 & 1 \\ 1 & 1 & 1 \\ 0 & 1 & 1 \end{pmatrix}$ 第3行乘(-1)加到第2行

 $\begin{pmatrix} 0 & 1 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{pmatrix}$ 第3行乘(-1)加到第1行

 $\begin{pmatrix} 0 & 1 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{pmatrix}$

→

第2行乘(-1)加到第1行



$$\begin{aligned} \text{以 } & \begin{pmatrix} 1 & 1 & 1 & 0 & 1 & 0 & 1 & -1 \\ 0 & 1 & 0 & \frac{1}{2} & -1 & 1 & 1 & 1 \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}, \\ \text{以 } & \begin{pmatrix} 1 & -1 & 1 & 0 & 1 & 0 & 1 & -1 \\ 1 & 1 & 1 & 1 & 0 & 2 & 0 & 1 \end{pmatrix} = \begin{pmatrix} 1 & 0 & 1 & -1 \\ 1 & 1 & 0 & 1 \end{pmatrix}. \end{aligned}$$

5.(2)) 因为

$$\begin{array}{ccc|l} 0 & 1 & 1 & 1 \text{ 第3行乘(-1)加到第2行} \\ \text{B} & 0 & 1 & 1 \text{ 第3行乘(-1)加到第1行} \\ @ & 0 & 0 & 1 \\ & 0 & 0 & 1 \text{ 第2行乘(-1)加到第1行} \end{array} \longrightarrow \begin{array}{ccc|l} 0 & 1 & 0 & 0 \\ \text{B} & 0 & 1 & 0 \text{ A,} \\ @ & 0 & 0 & 1 \\ & 0 & 0 & 1 \end{array}$$

习题1.4($P_{39} - P_{41}$)

$$\text{以 } \begin{pmatrix} 1 & 1 & 1 & 0 & 1 & 0 & 1 & -1 & 1 & 0 \\ 0 & 1 & 0 & \frac{1}{2} & -1 & 1 & 1 & 1 & 0 & 1 \end{pmatrix} =$$

$$\text{以 } \begin{pmatrix} 1 & -1 & 1 & 0 & 1 & 0 & 1 & -1 \\ 1 & 1 & 1 & 1 & 0 & 2 & 0 & 1 \end{pmatrix}.$$

5.(2)) 因为

$$\begin{array}{ccc|l} 0 & 1 & 1 & \text{第3行乘(-1)加到第2行} \\ 1 & 1 & 1 & \\ \text{B} @ 0 & 1 & 1 & \text{第3行乘(-1)加到第1行} \\ \text{C} @ 0 & 1 & 1 & \\ 0 & 0 & 1 & \longrightarrow \\ & & & \text{第2行乘(-1)加到第1行} \end{array} \quad \begin{array}{ccc|l} 0 & 1 & 1 & \\ 1 & 0 & 0 & \\ \text{B} @ 0 & 1 & 0 & \text{A, 以} \\ \text{C} @ 0 & 1 & 0 & \\ 0 & 0 & 1 & \end{array}$$

$$\begin{array}{cccc|cccc|cccc|cccc} 0 & 1 & 1 & 0 & 1 & 0 & 1 & 0 & 1 & 0 & 1 & 0 & 1 & 0 & 1 \\ 1 & -1 & 0 & 1 & 0 & -1 & 1 & 0 & 0 & 1 & 1 & 1 & 1 & 0 & 0 \\ \text{B} @ 0 & 1 & 0 & \text{C} @ 0 & 1 & 0 & \text{C} @ 0 & 1 & -1 & \text{C} @ 0 & 1 & 1 & \text{C} @ 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccccccccccc}
 0 & & & 1 & & 0 & & & 1 & 0 & & 1 & 0 & & 1 \\
 1 & 1 & 1 & & & 1 & 0 & 0 & & 1 & 0 & 1 & & 1 & 0 \\
 \text{以 } \begin{matrix} B \\ @ \end{matrix} \begin{matrix} 0 & 1 & 1 \end{matrix} \begin{matrix} C \\ A \end{matrix} = \begin{matrix} B \\ @ \end{matrix} \begin{matrix} 0 & 1 & 1 \end{matrix} \begin{matrix} C \\ A \end{matrix} \begin{matrix} B \\ @ \end{matrix} \begin{matrix} 0 & 1 & 0 \end{matrix} \begin{matrix} C \\ A \end{matrix} \begin{matrix} B \\ @ \end{matrix} \begin{matrix} 0 & 1 & 0 \end{matrix} \begin{matrix} C \\ A \end{matrix}. \\
 0 & 0 & 1 & & & 0 & 0 & 1 & & 0 & 0 & 1 & & 0 & 0 & 1
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccccccccccc}
 0 & & & 1 & & 0 & & & 1 & 0 & & 1 & 0 & & 1 \\
 1 & 1 & 1 & & 1 & 0 & 0 & 1 & 0 & 1 & 1 & 1 & 0 & & \\
 \text{以 } \begin{matrix} B \\ @ \end{matrix} \begin{matrix} 0 & 1 & 1 \\ 0 & 1 & 1 \end{matrix} \begin{matrix} C \\ A \end{matrix} = \begin{matrix} B \\ @ \end{matrix} \begin{matrix} 0 & 1 & 1 \\ 0 & 1 & 1 \end{matrix} \begin{matrix} C \\ A \end{matrix} \begin{matrix} B \\ @ \end{matrix} \begin{matrix} 0 & 1 & 0 \\ 0 & 1 & 0 \end{matrix} \begin{matrix} C \\ A \end{matrix} \begin{matrix} B \\ @ \end{matrix} \begin{matrix} 0 & 1 & 0 \\ 0 & 1 & 0 \end{matrix} \begin{matrix} C \\ A \end{matrix}. \\
 0 & 0 & 1 & & 0 & 0 & 1 & & 0 & 0 & 1 & & 0 & 0 & 1
 \end{array}$$

6.)



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccccccccccccccc} & 0 & & 1 & & 0 & & 1 & 0 & & 1 & 0 & & 1 \\ \text{以B} & 1 & 1 & 1 & & 1 & 0 & 0 & 1 & 0 & 1 & 1 & 1 & 0 \\ \text{@0} & 1 & 1 & 1 & \text{A} = & \text{@0} & 1 & 1 & \text{A} & \text{@0} & 1 & 0 & \text{A} & \text{@0} & 1 & 0 & \text{A} \\ & 0 & 0 & 1 & & 0 & 0 & 1 & & 0 & 0 & 1 & & 0 & 0 & 1 \end{array}$$

6.) 因为 !

$$1 \quad 2 \quad 1 \quad 0$$

3 4 0 1



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccccccccccc}
 0 & & & 1 & & 0 & & 1 & 0 & & 1 & 0 & & 1 \\
 1 & 1 & 1 & & 1 & 0 & 0 & 1 & 0 & 1 & 1 & 1 & 0 & \\
 \text{以 } \begin{matrix} B \\ @ \end{matrix} \begin{matrix} 0 & 1 & 1 \end{matrix} \begin{matrix} C \\ A \end{matrix} = \begin{matrix} B \\ @ \end{matrix} \begin{matrix} 0 & 1 & 1 \end{matrix} \begin{matrix} C \\ A \end{matrix} \begin{matrix} B \\ @ \end{matrix} \begin{matrix} 0 & 1 & 0 \end{matrix} \begin{matrix} C \\ A \end{matrix} \begin{matrix} B \\ @ \end{matrix} \begin{matrix} 0 & 1 & 0 \end{matrix} \begin{matrix} C \\ A \end{matrix}. \\
 0 & 0 & 1 & & 0 & 0 & 1 & & 0 & 0 & 1 & & 0 & 0 & 1
 \end{array}$$

6.) 因为 !

1 2 1 0 初等行变换

3 4 0 1 $\longrightarrow$





线性代数第一Ü: Y阵及其\$ 习题) 答

6.) 因为

$$\begin{pmatrix} 1 & 2 & 1 & 0 \\ 3 & 4 & 0 & 1 \end{pmatrix} \xrightarrow{\substack{\text{初等行变换} \\ -1}} \begin{pmatrix} 1 & 0 & -2 & 1 \\ 0 & 1 & \frac{3}{2} & -\frac{1}{2} \end{pmatrix},$$

以 $A^{-1} = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} = \begin{pmatrix} -2 & 1 \\ \frac{3}{2} & -\frac{1}{2} \end{pmatrix};$

习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccccccccccc}
 0 & 1 & 1 & 1 & 0 & 1 & 0 & 1 & 0 & 1 & 0 & 1 \\
 1 & 1 & 1 & 1 & 1 & 0 & 0 & 1 & 0 & 1 & 1 & 1 \\
 0 & 1 & 1 & 1 & 0 & 1 & 1 & 0 & 1 & 0 & 1 & 0 \\
 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1
 \end{array}$$

以 $\begin{matrix} B \\ @ \end{matrix} \begin{matrix} 0 & 1 & 1 \\ 0 & 1 & 1 \end{matrix} \begin{matrix} C \\ A \end{matrix} = \begin{matrix} B \\ @ \end{matrix} \begin{matrix} 0 & 1 & 1 \\ 0 & 1 & 1 \end{matrix} \begin{matrix} C \\ A \end{matrix} \begin{matrix} B \\ @ \end{matrix} \begin{matrix} 0 & 1 & 0 \\ 0 & 1 & 0 \end{matrix} \begin{matrix} C \\ A \end{matrix} \begin{matrix} B \\ @ \end{matrix} \begin{matrix} 0 & 1 & 0 \\ 0 & 1 & 0 \end{matrix} \begin{matrix} C \\ A \end{matrix}.$

6.) 因为 !

$$\begin{array}{cccc}
 1 & 2 & 1 & 0 \\
 3 & 4 & 0 & 1
 \end{array}
 \xrightarrow{\substack{\text{初等行变换} \\ -1}}
 \begin{array}{cccc}
 1 & 0 & -2 & 1 \\
 0 & 1 & \frac{3}{2} & -\frac{1}{2}
 \end{array},$$

$$\text{以 } A^{-1} = \begin{array}{cc} 1 & 2 \\ 3 & 4 \end{array} = \begin{array}{cc} -2 & 1 \\ \frac{3}{2} & -\frac{1}{2} \end{array};$$

$$\begin{array}{cccc}
 1 & 3 & 1 & 0 \\
 2 & 4 & 0 & 1
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccccccccccc}
 0 & 1 & 1 & 1 & 0 & 1 & 0 & 0 & 1 & 0 & 1 & 0 & 1 & 1 & 0 & 1 \\
 \text{以 } \begin{array}{c} B \\ @ \end{array} \begin{array}{c} 0 \\ 0 \end{array} \begin{array}{c} 1 \\ 1 \end{array} \begin{array}{c} C \\ A \end{array} = \begin{array}{c} B \\ @ \end{array} \begin{array}{c} 0 \\ 0 \end{array} \begin{array}{c} 1 \\ 1 \end{array} \begin{array}{c} C \\ A \end{array} \begin{array}{c} B \\ @ \end{array} \begin{array}{c} 0 \\ 0 \end{array} \begin{array}{c} 1 \\ 1 \end{array} \begin{array}{c} C \\ A \end{array} \begin{array}{c} B \\ @ \end{array} \begin{array}{c} 0 \\ 0 \end{array} \begin{array}{c} 1 \\ 1 \end{array} \begin{array}{c} C \\ A \end{array}. \\
 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 & 1
 \end{array}$$

6.) 因为 !

$$\begin{array}{cccc}
 1 & 2 & 1 & 0 \\
 3 & 4 & 0 & 1
 \end{array}
 \begin{array}{l}
 \text{初等行变换} \\
 \xrightarrow{! -1}
 \end{array}
 \begin{array}{cccc}
 1 & 0 & -2 & 1 \\
 0 & 1 & \frac{3}{2} & -\frac{1}{2}
 \end{array}
 ,$$

$$\text{以 } A^{-1} = \begin{array}{cc} 1 & 2 \\ 3 & 4 \end{array} = \begin{array}{cc} -2 & 1 \\ \frac{3}{2} & -\frac{1}{2} \end{array} ;$$

$$\begin{array}{cccc}
 1 & 3 & 1 & 0 \\
 2 & 4 & 0 & 1
 \end{array}
 \begin{array}{l}
 \text{初等行变换} \\
 \longrightarrow
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccccccccccc} & 0 & & 1 & & 0 & & 1 & 0 & & 1 & 0 & & 1 \\ \text{以 } \mathbf{B} @ 0 & 1 & 1 & 1 & \mathbf{A} = & \mathbf{B} @ 0 & 1 & 1 & \mathbf{A} @ 0 & 1 & 0 & \mathbf{A} @ 0 & 1 & 0 & \mathbf{A} \\ & 0 & 0 & 1 & & 0 & 0 & 1 & & 0 & 0 & 1 & & 0 & 0 & 1 \end{array}$$

6.) 因为 !

$$\begin{array}{cccc|l} 1 & 2 & 1 & 0 & \text{初等行变换} & 1 & 0 & -2 & 1 \\ 3 & 4 & 0 & 1 & \longrightarrow & 0 & 1 & \frac{3}{2} & -\frac{1}{2} \\ & & & & \downarrow -1 & & & & \\ \text{以 } A^{-1} = & \begin{array}{cc} 1 & 2 \\ 3 & 4 \end{array} & = & \begin{array}{cc} -2 & 1 \\ \frac{3}{2} & -\frac{1}{2} \end{array} ; & & & & & \\ & & & & \downarrow & & & & \\ 1 & 3 & 1 & 0 & \text{初等行变换} & 1 & 0 & -2 & \frac{3}{2} \\ 2 & 4 & 0 & 1 & \longrightarrow & 0 & 1 & 1 & -\frac{1}{2} \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{ccccccc}
 0 & 1 & 0 & 1 & 0 & 1 & 0 \\
 1 & 1 & 1 & 1 & 0 & 0 & 1 \\
 0 & 1 & 1 & 0 & 1 & 0 & 1 \\
 0 & 1 & 1 & 0 & 1 & 0 & 1
 \end{array}$$

以 $\begin{matrix} B \\ @ \end{matrix} \begin{matrix} 0 & 1 & 1 \\ 0 & 1 & 1 \end{matrix} \begin{matrix} C \\ A \end{matrix} = \begin{matrix} B \\ @ \end{matrix} \begin{matrix} 0 & 1 & 1 \\ 0 & 1 & 1 \end{matrix} \begin{matrix} C \\ A \end{matrix} \begin{matrix} B \\ @ \end{matrix} \begin{matrix} 0 & 1 & 0 \\ 0 & 1 & 0 \end{matrix} \begin{matrix} C \\ A \end{matrix} \begin{matrix} B \\ @ \end{matrix} \begin{matrix} 0 & 1 & 0 \\ 0 & 1 & 0 \end{matrix} \begin{matrix} C \\ A \end{matrix}.$

$$\begin{array}{ccccccc}
 0 & 0 & 1 & 0 & 0 & 1 & 0 \\
 0 & 0 & 1 & 0 & 0 & 1 & 0 \\
 0 & 0 & 1 & 0 & 0 & 1 & 0
 \end{array}$$

6.) 因为 !

$$\begin{array}{cccc}
 1 & 2 & 1 & 0 \\
 3 & 4 & 0 & 1
 \end{array}
 \xrightarrow{\substack{\text{初等行变换} \\ -1}}
 \begin{array}{cccc}
 1 & 0 & -2 & 1 \\
 0 & 1 & \frac{3}{2} & -\frac{1}{2}
 \end{array},$$

$$\text{以 } A^{-1} = \begin{array}{cc} 1 & 2 \\ 3 & 4 \end{array} = \begin{array}{cc} -2 & 1 \\ \frac{3}{2} & -\frac{1}{2} \end{array};$$

$$\begin{array}{cccc}
 1 & 3 & 1 & 0 \\
 2 & 4 & 0 & 1
 \end{array}
 \xrightarrow{\substack{\text{初等行变换} \\ -1}}
 \begin{array}{cccc}
 1 & 0 & -2 & \frac{3}{2} \\
 0 & 1 & 1 & -\frac{1}{2}
 \end{array},$$

$$\text{以 } B^{-1} = \begin{array}{cc} 1 & 3 \\ 2 & 4 \end{array} = \begin{array}{cc} -2 & \frac{3}{2} \\ 1 & -\frac{1}{2} \end{array};$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccc|cccc|cccc}
 0 & 1 & 1 & 0 & 1 & 0 & 1 & 0 & 1 & 0 & 1 & 1 & 0 & 1 \\
 1 & 1 & 1 & 0 & 1 & 0 & 1 & 0 & 1 & 0 & 1 & 1 & 1 & 0 \\
 \text{以 } \begin{array}{c} B \\ @0 \end{array} \begin{array}{c} 1 \\ 1 \end{array} \begin{array}{c} C \\ A \end{array} = \begin{array}{c} B \\ @0 \end{array} \begin{array}{c} 1 \\ 1 \end{array} \begin{array}{c} C \\ A \end{array} \begin{array}{c} B \\ @0 \end{array} \begin{array}{c} 1 \\ 1 \end{array} \begin{array}{c} C \\ A \end{array} \begin{array}{c} B \\ @0 \end{array} \begin{array}{c} 1 \\ 1 \end{array} \begin{array}{c} C \\ A \end{array} \\
 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 1
 \end{array}$$

6.) 因为 !

$$\begin{array}{ccc|c}
 1 & 2 & 1 & 0 \\
 3 & 4 & 0 & 1
 \end{array}
 \xrightarrow{\substack{\text{初等行变换} \\ -1}}
 \begin{array}{ccc|c}
 1 & 0 & -2 & 1 \\
 0 & 1 & \frac{3}{2} & -\frac{1}{2}
 \end{array},$$

$$\text{以 } A^{-1} = \begin{array}{cc} 1 & 2 \\ 3 & 4 \end{array} = \begin{array}{cc} -2 & 1 \\ \frac{3}{2} & -\frac{1}{2} \end{array};$$

$$\begin{array}{ccc|c}
 1 & 3 & 1 & 0 \\
 2 & 4 & 0 & 1
 \end{array}
 \xrightarrow{\substack{\text{初等行变换} \\ -1}}
 \begin{array}{ccc|c}
 1 & 0 & -2 & \frac{3}{2} \\
 0 & 1 & 1 & -\frac{1}{2}
 \end{array},$$

$$\text{以 } B^{-1} = \begin{array}{cc} 1 & 3 \\ 2 & 4 \end{array} = \begin{array}{cc} -2 & \frac{3}{2} \\ 1 & -\frac{1}{2} \end{array};$$

$$A^T = B; B^{-1} = (A^{-1})^T;$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{ccccccccc}
 0 & 1 & 1 & 0 & 1 & 0 & 1 & 0 & 1 \\
 1 & 1 & 1 & 1 & 0 & 0 & 1 & 0 & 1 \\
 0 & 1 & 1 & 0 & 1 & 1 & 0 & 1 & 0
 \end{array}$$

以 $\begin{matrix} B \\ @ \end{matrix} \begin{matrix} 0 & 1 & 1 \\ 0 & 1 & 1 \end{matrix} \begin{matrix} C \\ A \end{matrix} = \begin{matrix} B \\ @ \end{matrix} \begin{matrix} 0 & 1 & 1 \\ 0 & 1 & 1 \end{matrix} \begin{matrix} C \\ A \end{matrix} \begin{matrix} B \\ @ \end{matrix} \begin{matrix} 0 & 1 & 0 \\ 0 & 1 & 0 \end{matrix} \begin{matrix} C \\ A \end{matrix} \begin{matrix} B \\ @ \end{matrix} \begin{matrix} 0 & 1 & 0 \\ 0 & 1 & 0 \end{matrix} \begin{matrix} C \\ A \end{matrix}.$

$$\begin{array}{ccccccccc}
 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 \\
 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1
 \end{array}$$

6.) 因为 !

$$\begin{array}{cccc}
 1 & 2 & 1 & 0 \\
 3 & 4 & 0 & 1
 \end{array}
 \xrightarrow{\substack{\text{初等行变换} \\ -1}}
 \begin{array}{cccc}
 1 & 0 & -2 & 1 \\
 0 & 1 & \frac{3}{2} & -\frac{1}{2}
 \end{array},$$

$$\text{以 } A^{-1} = \begin{array}{cc} 1 & 2 \\ 3 & 4 \end{array} = \begin{array}{cc} -2 & 1 \\ \frac{3}{2} & -\frac{1}{2} \end{array};$$

$$\begin{array}{cccc}
 1 & 3 & 1 & 0 \\
 2 & 4 & 0 & 1
 \end{array}
 \xrightarrow{\substack{\text{初等行变换} \\ -1}}
 \begin{array}{cccc}
 1 & 0 & -2 & \frac{3}{2} \\
 0 & 1 & 1 & -\frac{1}{2}
 \end{array},$$

$$\text{以 } B^{-1} = \begin{array}{cc} 1 & 3 \\ 2 & 4 \end{array} = \begin{array}{cc} -2 & \frac{3}{2} \\ 1 & -\frac{1}{2} \end{array};$$

$$A^T = B; B^{-1} = (A^{-1})^T; (A^T)^{-1} = (A^{-1})^T.$$



习题1.4($P_{39} - P_{41}$)

$$\text{因为 } A + B = \begin{pmatrix} 2 & 5 \\ 5 & 8 \end{pmatrix},$$



习题1.4($P_{39} - P_{41}$)

因为 $A + B = \begin{pmatrix} 2 & 5 \\ 5 & 8 \end{pmatrix}$,

而 $\begin{pmatrix} 2 & 5 & 1 & 0 \\ 5 & 8 & 0 & 1 \end{pmatrix}$



习题1.4($P_{39} - P_{41}$)

$$\text{因为 } A + B = \begin{pmatrix} 2 & 5 \\ 5 & 8 \end{pmatrix},$$

$$\text{而 } \begin{pmatrix} 2 & 5 & 1 & 0 \\ 5 & 8 & 0 & 1 \end{pmatrix} \xrightarrow{\text{初等行变换}}$$

习题1.4($P_{39} - P_{41}$)

$$\text{因为 } A + B = \begin{pmatrix} 2 & 5 \\ 5 & 8 \end{pmatrix},$$

$$\text{而 } \begin{pmatrix} 2 & 5 & 1 & 0 \\ 5 & 8 & 0 & 1 \end{pmatrix} \xrightarrow{\text{初等行变换}} \begin{pmatrix} 1 & 0 & -\frac{8}{9} & \frac{5}{9} \\ 0 & 1 & \frac{5}{9} & -\frac{2}{9} \end{pmatrix},$$



习题1.4($P_{39} - P_{41}$)

$$\text{因为 } A + B = \begin{pmatrix} 2 & 5 \\ 5 & 8 \end{pmatrix},$$

$$\text{而 } \begin{pmatrix} 2 & 5 & 1 & 0 \\ 5 & 8 & 0 & 1 \end{pmatrix} \xrightarrow{\text{初等行变换}} \begin{pmatrix} 1 & 0 & -\frac{8}{9} & \frac{5}{9} \\ 0 & 1 & \frac{5}{9} & -\frac{2}{9} \end{pmatrix},$$

$$\text{以 } (A + B)^{-1} = \begin{pmatrix} 2 & 5 \\ 5 & 8 \end{pmatrix}^{-1} = \begin{pmatrix} -\frac{8}{9} & \frac{5}{9} \\ \frac{5}{9} & -\frac{2}{9} \end{pmatrix};$$



习题1.4($P_{39} - P_{41}$)

$$\text{因为 } A + B = \begin{pmatrix} 2 & 5 \\ 5 & 8 \end{pmatrix},$$

$$\text{而 } \begin{pmatrix} 2 & 5 & 1 & 0 \\ 5 & 8 & 0 & 1 \end{pmatrix} \xrightarrow{\text{初等行变换}} \begin{pmatrix} 1 & 0 & -\frac{8}{9} & \frac{5}{9} \\ 0 & 1 & \frac{5}{9} & -\frac{2}{9} \end{pmatrix},$$

$$\text{以 } (A + B)^{-1} = \begin{pmatrix} 2 & 5 \\ 5 & 8 \end{pmatrix}^{-1} = \begin{pmatrix} -\frac{8}{9} & \frac{5}{9} \\ \frac{5}{9} & -\frac{2}{9} \end{pmatrix};$$

$$\text{因为 } AB = \begin{pmatrix} 5 & 11 \\ 11 & 25 \end{pmatrix},$$



习题1.4($P_{39} - P_{41}$)

$$\text{因为 } A + B = \begin{pmatrix} 2 & 5 \\ 5 & 8 \end{pmatrix},$$

$$\text{而 } \begin{pmatrix} 2 & 5 & 1 & 0 \\ 5 & 8 & 0 & 1 \end{pmatrix} \xrightarrow{\text{初等行变换}} \begin{pmatrix} 1 & 0 & -\frac{8}{9} & \frac{5}{9} \\ 0 & 1 & \frac{5}{9} & -\frac{2}{9} \end{pmatrix},$$

$$\text{以 } (A + B)^{-1} = \begin{pmatrix} 2 & 5 \\ 5 & 8 \end{pmatrix}^{-1} = \begin{pmatrix} -\frac{8}{9} & \frac{5}{9} \\ \frac{5}{9} & -\frac{2}{9} \end{pmatrix};$$

$$\text{因为 } AB = \begin{pmatrix} 5 & 11 \\ 11 & 25 \end{pmatrix},$$

$$\text{而 } \begin{pmatrix} 5 & 11 & 1 & 0 \\ 11 & 25 & 0 & 1 \end{pmatrix}$$



习题1.4($P_{39} - P_{41}$)

$$\text{因为 } A + B = \begin{pmatrix} 2 & 5 \\ 5 & 8 \end{pmatrix},$$

$$\text{而 } \begin{pmatrix} 2 & 5 & 1 & 0 \\ 5 & 8 & 0 & 1 \end{pmatrix} \xrightarrow{\text{初等行变换}} \begin{pmatrix} 1 & 0 & -\frac{8}{9} & \frac{5}{9} \\ 0 & 1 & \frac{5}{9} & -\frac{2}{9} \end{pmatrix},$$

$$\text{以 } (A + B)^{-1} = \begin{pmatrix} 2 & 5 \\ 5 & 8 \end{pmatrix}^{-1} = \begin{pmatrix} -\frac{8}{9} & \frac{5}{9} \\ \frac{5}{9} & -\frac{2}{9} \end{pmatrix};$$

$$\text{因为 } AB = \begin{pmatrix} 5 & 11 \\ 11 & 25 \end{pmatrix},$$

$$\text{而 } \begin{pmatrix} 5 & 11 & 1 & 0 \\ 11 & 25 & 0 & 1 \end{pmatrix} \xrightarrow{\text{初等行变换}}$$



习题1.4($P_{39} - P_{41}$)

$$\text{因为 } A + B = \begin{pmatrix} 2 & 5 \\ 5 & 8 \end{pmatrix},$$

$$\text{而 } \begin{pmatrix} 2 & 5 & 1 & 0 \\ 5 & 8 & 0 & 1 \end{pmatrix} \xrightarrow{\text{初等行变换}} \begin{pmatrix} 1 & 0 & -\frac{8}{9} & \frac{5}{9} \\ 0 & 1 & \frac{5}{9} & -\frac{2}{9} \end{pmatrix},$$

$$\text{以 } (A + B)^{-1} = \begin{pmatrix} 2 & 5 \\ 5 & 8 \end{pmatrix}^{-1} = \begin{pmatrix} -\frac{8}{9} & \frac{5}{9} \\ \frac{5}{9} & -\frac{2}{9} \end{pmatrix};$$

$$\text{因为 } AB = \begin{pmatrix} 5 & 11 \\ 11 & 25 \end{pmatrix},$$

$$\text{而 } \begin{pmatrix} 5 & 11 & 1 & 0 \\ 11 & 25 & 0 & 1 \end{pmatrix} \xrightarrow{\text{初等行变换}} \begin{pmatrix} 1 & 0 & \frac{25}{4} & -\frac{11}{4} \\ 0 & 1 & -\frac{11}{4} & \frac{5}{4} \end{pmatrix},$$



习题1.4($P_{39} - P_{41}$)

$$\text{因为 } A + B = \begin{pmatrix} 2 & 5 \\ 5 & 8 \end{pmatrix},$$

$$\text{而 } \begin{pmatrix} 2 & 5 & 1 & 0 \\ 5 & 8 & 0 & 1 \end{pmatrix} \xrightarrow{\text{初等行变换}} \begin{pmatrix} 1 & 0 & -\frac{8}{9} & \frac{5}{9} \\ 0 & 1 & \frac{5}{9} & -\frac{2}{9} \end{pmatrix},$$

$$\text{以 } (A + B)^{-1} = \begin{pmatrix} 2 & 5 \\ 5 & 8 \end{pmatrix}^{-1} = \begin{pmatrix} -\frac{8}{9} & \frac{5}{9} \\ \frac{5}{9} & -\frac{2}{9} \end{pmatrix};$$

$$\text{因为 } AB = \begin{pmatrix} 5 & 11 \\ 11 & 25 \end{pmatrix},$$

$$\text{而 } \begin{pmatrix} 5 & 11 & 1 & 0 \\ 11 & 25 & 0 & 1 \end{pmatrix} \xrightarrow{\text{初等行变换}} \begin{pmatrix} 1 & 0 & \frac{25}{4} & -\frac{11}{4} \\ 0 & 1 & -\frac{11}{4} & \frac{5}{4} \end{pmatrix},$$

$$\text{以 } (AB)^{-1} = \begin{pmatrix} 5 & 11 \\ 11 & 25 \end{pmatrix}^{-1} = \begin{pmatrix} \frac{25}{4} & -\frac{11}{4} \\ -\frac{11}{4} & \frac{5}{4} \end{pmatrix}$$



习题1.4($P_{39} - P_{41}$)

$$\text{因为 } A + B = \begin{pmatrix} 2 & 5 \\ 5 & 8 \end{pmatrix},$$

$$\text{而 } \begin{pmatrix} 2 & 5 & 1 & 0 \\ 5 & 8 & 0 & 1 \end{pmatrix} \xrightarrow{\text{初等行变换}} \begin{pmatrix} 1 & 0 & -\frac{8}{9} & \frac{5}{9} \\ 0 & 1 & \frac{5}{9} & -\frac{2}{9} \end{pmatrix},$$

$$\text{以 } (A + B)^{-1} = \begin{pmatrix} 2 & 5 \\ 5 & 8 \end{pmatrix}^{-1} = \begin{pmatrix} -\frac{8}{9} & \frac{5}{9} \\ \frac{5}{9} & -\frac{2}{9} \end{pmatrix};$$

$$\text{因为 } AB = \begin{pmatrix} 5 & 11 \\ 11 & 25 \end{pmatrix},$$

$$\text{而 } \begin{pmatrix} 5 & 11 & 1 & 0 \\ 11 & 25 & 0 & 1 \end{pmatrix} \xrightarrow{\text{初等行变换}} \begin{pmatrix} 1 & 0 & \frac{25}{4} & -\frac{11}{4} \\ 0 & 1 & -\frac{11}{4} & \frac{5}{4} \end{pmatrix},$$

$$\text{以 } (AB)^{-1} = \begin{pmatrix} 5 & 11 \\ 11 & 25 \end{pmatrix}^{-1} = \begin{pmatrix} \frac{25}{4} & -\frac{11}{4} \\ -\frac{11}{4} & \frac{5}{4} \end{pmatrix} = B^{-1}A^{-1}.$$

习题1.4($P_{39} - P_{41}$)

7.(1))



习题1.4($P_{39} - P_{41}$)

$$7.(1) \text{) 构造 } \dot{Y} \text{ 阵 } A \quad B = \begin{pmatrix} 4 & 1 & 5 & 4 \\ 6 & 1 & 5 & 8 \end{pmatrix},$$





习题1.4($P_{39} - P_{41}$)

7.(1)) 构造 $\dot{Y}$ 阵 $A \quad B = \begin{matrix} & & & ! \\ 4 & 1 & 5 & 4 \\ 6 & 1 & 5 & 8 \end{matrix}$, 对其?行初等

行变换, 将其左侧化为单位 $\dot{Y}$ 阵, K 其右侧即为 $A^{-1}B$.

$$\begin{matrix} & & & ! \\ 4 & 1 & 5 & 4 \\ 6 & 1 & 5 & 8 \end{matrix}$$



习题1.4($P_{39} - P_{41}$)

7.(1)) 构造 $\dot{Y}$ 阵 $A \quad B = \begin{matrix} & & & ! \\ 4 & 1 & 5 & 4 \\ 6 & 1 & 5 & 8 \end{matrix}$, 对其?行初等

行变换, 将其左侧化为单位 $\dot{Y}$ 阵, K 其右侧即为 $A^{-1}B$.

$$\begin{matrix} & & & ! \\ 4 & 1 & 5 & 4 \\ 6 & 1 & 5 & 8 \end{matrix} \xrightarrow{\text{初等行变换}} \begin{matrix} & & & ! \\ 1 & 0 & 0 & 2 \\ 0 & 1 & 5 & -4 \end{matrix}$$



习题1.4($P_{39} - P_{41}$)

7.(1)) 构造 $\dot{Y}$ 阵 $A \quad B = \begin{matrix} & & & ! \\ 4 & 1 & 5 & 4 \\ 6 & 1 & 5 & 8 \end{matrix}$, 对其?行初等

行变换, 将其左侧化为单位 $\dot{Y}$ 阵, K 其右侧即为 $A^{-1}B$.

$$\begin{matrix} & & & ! \\ 4 & 1 & 5 & 4 \\ 6 & 1 & 5 & 8 \end{matrix} \xrightarrow{\text{初等行变换}} \begin{matrix} & & & ! \\ 1 & 0 & 0 & 2 \\ 0 & 1 & 5 & -4 \end{matrix}$$

$$\text{以 } X = A^{-1}B = \begin{matrix} & & & ! \\ 0 & 2 \\ 5 & -4 \end{matrix}.$$



习题1.4($P_{39} - P_{41}$)

7.(1)) 构作 $\dot{Y}$ 阵 $A \quad B = \begin{matrix} & & & ! \\ 4 & 1 & 5 & 4 \\ 6 & 1 & 5 & 8 \end{matrix}$, 对其?行初等

行变换, 将其左侧化为单位 $\dot{Y}$ 阵, K 其右侧即为 $A^{-1}B$.

$$\begin{matrix} & & & ! \\ 4 & 1 & 5 & 4 \\ 6 & 1 & 5 & 8 \end{matrix} \xrightarrow{\text{初等行变换}} \begin{matrix} & & & ! \\ 1 & 0 & 0 & 2 \\ 0 & 1 & 5 & -4 \end{matrix}$$

$$\text{以 } X = A^{-1}B = \begin{matrix} & & & ! \\ 0 & 2 \\ 5 & -4 \end{matrix}.$$

7.(2))



习题1.4($P_{39} - P_{41}$)

7.(1)) 构作 $\dot{Y}$ 阵 $A \quad B = \begin{matrix} & & & ! \\ 4 & 1 & 5 & 4 \\ 6 & 1 & 5 & 8 \end{matrix}$, 对其?行初等

行变换, 将其左侧化为单位 $\dot{Y}$ 阵, K 其右侧即为 $A^{-1}B$.

$$\begin{matrix} & & & ! \\ 4 & 1 & 5 & 4 \\ 6 & 1 & 5 & 8 \end{matrix} \xrightarrow{\text{初等行变换}} \begin{matrix} & & & ! \\ 1 & 0 & 0 & 2 \\ 0 & 1 & 5 & -4 \end{matrix}$$

$$\text{以 } X = A^{-1}B = \begin{matrix} & & & ! \\ 0 & 2 \\ 5 & -4 \end{matrix}.$$

7.(2)) 构作 $\dot{Y}$ 阵 $A \quad B = \begin{matrix} & & & 1 \\ 1 & 1 & -1 & 1 \\ 0 & 2 & -5 & 2 \\ 1 & 0 & 1 & 3 \end{matrix} \begin{matrix} \\ B \\ @ \\ A \end{matrix} C,$



习题1.4($P_{39} - P_{41}$)

7.(1)) 构作 $\dot{Y}$ 阵 $A \quad B = \begin{matrix} & & & ! \\ 4 & 1 & 5 & 4 \\ 6 & 1 & 5 & 8 \end{matrix}$, 对其?行初等

行变换, 将其左侧化为单位 $\dot{Y}$ 阵, K 其右侧即为 $A^{-1}B$.

$$\begin{matrix} & & & ! \\ 4 & 1 & 5 & 4 \\ 6 & 1 & 5 & 8 \end{matrix} \xrightarrow{\text{初等行变换}} \begin{matrix} & & & ! \\ 1 & 0 & 0 & 2 \\ 0 & 1 & 5 & -4 \end{matrix}$$

$$\text{以 } X = A^{-1}B = \begin{matrix} & & & ! \\ 0 & 2 \\ 5 & -4 \end{matrix}.$$

7.(2)) 构作 $\dot{Y}$ 阵 $A \quad B = \begin{matrix} & & & 1 \\ 1 & 1 & -1 & 1 \\ 0 & 2 & -5 & 2 \\ 1 & 0 & 1 & 3 \end{matrix} \begin{matrix} B \\ C \\ A \end{matrix}$, 对其?行初

等行变换, 将其左侧化为单位 $\dot{Y}$ 阵, K 其右侧即为 $A^{-1}B$.



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccc}
 0 & & & 1 \\
 1 & 1 & -1 & 1 \\
 0 & 2 & -5 & 2 \\
 1 & 0 & 1 & 3
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccc}
 0 & & & 1 \\
 1 & 1 & -1 & 1 \\
 0 & 2 & -5 & 2 \\
 1 & 0 & 1 & 3
 \end{array}
 \begin{array}{l}
 \text{B} \\
 \text{A}
 \end{array}
 \xrightarrow{\text{初等行变换}}
 \begin{array}{cccc}
 0 & & & 1 \\
 1 & 0 & 0 & 9 \\
 0 & 1 & 0 & -14 \\
 0 & 0 & 1 & -6
 \end{array}
 \begin{array}{l}
 \text{B} \\
 \text{A}
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccc}
 0 & & & 1 \\
 1 & 1 & -1 & 1 \\
 B & & & C \\
 @0 & 2 & -5 & 2 A \\
 1 & 0 & 1 & 3
 \end{array}
 \xrightarrow{\text{初等行变换}}
 \begin{array}{cccc}
 0 & & & 1 \\
 1 & 0 & 0 & 9 \\
 B & & & C \\
 @0 & 1 & 0 & -14 A \\
 0 & 0 & 1 & -6
 \end{array}$$

以 $X = A^{-1}$ 

习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccc|c}
 0 & & & & 1 \\
 1 & 1 & -1 & 1 & \\
 B & & & & C \\
 @0 & 2 & -5 & 2 & A \\
 1 & 0 & 1 & 3 & \\
 & & 0 & 1 & \\
 & & & 9 & \\
 \text{以 } X = A^{-1}B = & B & & C & \\
 @ & -14 & & A & \\
 & & & -6 &
 \end{array}
 \xrightarrow{\text{初等行变换}}
 \begin{array}{cccc|c}
 0 & & & & 1 \\
 1 & 0 & 0 & 9 & \\
 B & & & & C \\
 @0 & 1 & 0 & -14 & A \\
 0 & 0 & 1 & -6 &
 \end{array}$$

7.(3))



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccc}
 0 & & & 1 \\
 1 & 1 & -1 & 1 \\
 B & & & C \\
 @0 & 2 & -5 & 2 A \\
 1 & 0 & 1 & 3
 \end{array}
 \xrightarrow{\text{初等行变换}}
 \begin{array}{cccc}
 0 & & & 1 \\
 1 & 0 & 0 & 9 \\
 B & & & C \\
 @0 & 1 & 0 & -14 A \\
 0 & 0 & 1 & -6
 \end{array}$$

$$\text{以 } X = A^{-1}B = \begin{array}{cc} B & C \\ @ & -14 A \\ & -6 \end{array}$$

7.(3)) 构作 $\dot{Y}$ 阵

$$A \quad B = \begin{array}{ccccc}
 0 & & & & 1 \\
 1 & -2 & 0 & -1 & 4 \\
 B & & & & C \\
 @4 & -2 & -1 & 2 & 5 A \\
 -3 & 1 & 2 & 1 & -3
 \end{array};$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccc}
 0 & & & 1 \\
 1 & 1 & -1 & 1 \\
 0 & 2 & -5 & 2 \\
 1 & 0 & 1 & 3
 \end{array}
 \begin{array}{l}
 B \\
 @ \\
 C \\
 A
 \end{array}
 \xrightarrow{\text{初等行变换}}
 \begin{array}{cccc}
 0 & & & 1 \\
 1 & 0 & 0 & 9 \\
 0 & 1 & 0 & -14 \\
 0 & 0 & 1 & -6
 \end{array}
 \begin{array}{l}
 B \\
 @ \\
 C \\
 A
 \end{array}$$

$$\text{以 } X = A^{-1}B = \begin{array}{cc} B & C \\ @ & -14 \\ -6 & \end{array} A.$$

7.(3)) 构作 $\dot{Y}$ 阵

$$A \quad B = \begin{array}{cc} B & C \\ @ & \\ -3 & 1 & 2 & 1 & -3 \end{array} \begin{array}{cc} 0 & 1 \\ 1 & -2 & 0 & -1 & 4 \\ 4 & -2 & -1 & 2 & 5 \end{array} A;$$

初等行变换化其左侧为单位 $\dot{Y}$ 阵, K 其右侧即为 $A^{-1}B$.



习题1.4($P_{39} - P_{41}$)

0					1
	1	-2	0	-1	4
B					C
@	4	-2	-1	2	5
	-3	1	2	1	-3
					A



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccccc}
 0 & & & & & 1 \\
 1 & -2 & 0 & -1 & 4 & \\
 \text{B} & 4 & -2 & -1 & 2 & 5 \\
 @ & & & & & \\
 -3 & 1 & 2 & 1 & -3 &
 \end{array}
 \begin{array}{c}
 \text{C} \\
 \text{A}
 \end{array}
 \xrightarrow{\text{初等行变换}}
 \begin{array}{cccccc}
 0 & & & & & 1 \\
 1 & 0 & 0 & \frac{13}{7} & \frac{54}{7} & \\
 \text{B} & 0 & 1 & 0 & \frac{10}{7} & \frac{13}{7} \\
 @ & & & & & \\
 0 & 0 & 1 & \frac{18}{7} & -\frac{1}{7} &
 \end{array}
 \begin{array}{c}
 \text{C} \\
 \text{A};
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{ccccc}
 0 & & & & 1 \\
 1 & -2 & 0 & -1 & 4 \\
 4 & -2 & -1 & 2 & 5 \\
 -3 & 1 & 2 & 1 & -3
 \end{array}
 \begin{array}{c}
 B \\
 @ \\
 A
 \end{array}
 \xrightarrow{\text{初等行变换}}
 \begin{array}{ccccc}
 0 & & & & 1 \\
 1 & 0 & 0 & \frac{13}{7} & \frac{54}{7} \\
 0 & 1 & 0 & \frac{10}{7} & \frac{13}{7} \\
 0 & 0 & 1 & \frac{18}{7} & -\frac{1}{7}
 \end{array}
 \begin{array}{c}
 C \\
 A;
 \end{array}$$

$$\text{以 } X = A^{-1}B = \begin{array}{cc}
 0 & 1 \\
 \frac{13}{7} & \frac{54}{7} \\
 \frac{10}{7} & \frac{13}{7} \\
 \frac{18}{7} & -\frac{1}{7}
 \end{array}
 \begin{array}{c}
 B \\
 @ \\
 A
 \end{array}
 :$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{ccccc}
 0 & & & & 1 \\
 1 & -2 & 0 & -1 & 4 \\
 \textcircled{B} & 4 & -2 & -1 & 2 \\
 -3 & 1 & 2 & 1 & -3
 \end{array}
 \begin{array}{c}
 \\
 \\
 \textcircled{A} \\
 \\
 \end{array}
 \xrightarrow{\text{初等行变换}}
 \begin{array}{ccccc}
 0 & & & & 1 \\
 1 & 0 & 0 & \frac{13}{7} & \frac{54}{7} \\
 \textcircled{B} & 0 & 1 & 0 & \frac{10}{7} \\
 0 & 0 & 1 & \frac{18}{7} & -\frac{1}{7}
 \end{array}
 \begin{array}{c}
 \\
 \\
 \textcircled{A} \\
 \\
 \end{array};$$

$$\text{以 } X = A^{-1}B = \begin{array}{ccccc}
 0 & & & & 1 \\
 \frac{13}{7} & & & & \frac{54}{7} \\
 \textcircled{B} & \frac{10}{7} & & & \frac{13}{7} \\
 \frac{18}{7} & & & & -\frac{1}{7}
 \end{array} \textcircled{A}:$$

8.(1))



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{ccccc}
 0 & & & & 1 \\
 1 & -2 & 0 & -1 & 4 \\
 4 & -2 & -1 & 2 & 5 \\
 -3 & 1 & 2 & 1 & -3
 \end{array}
 \begin{array}{c}
 B \\
 @ \\
 A
 \end{array}
 \xrightarrow{\text{初等行变换}}
 \begin{array}{ccccc}
 0 & & & & 1 \\
 1 & 0 & 0 & \frac{13}{7} & \frac{54}{7} \\
 0 & 1 & 0 & \frac{10}{7} & \frac{13}{7} \\
 0 & 0 & 1 & \frac{18}{7} & -\frac{1}{7}
 \end{array}
 \begin{array}{c}
 C \\
 A;
 \end{array}$$

$$\text{以 } X = A^{-1}B = \begin{array}{ccccc}
 0 & & & & 1 \\
 \frac{13}{7} & & & & \frac{54}{7} \\
 \frac{10}{7} & & & & \frac{13}{7} \\
 \frac{18}{7} & & & & -\frac{1}{7}
 \end{array}
 \begin{array}{c}
 B \\
 @ \\
 A
 \end{array}
 C:$$

8.(1)) 构造 $\dot{Y}$ 阵

$$A \quad I = \begin{array}{ccccc}
 0 & & & & 1 \\
 3 & -1 & 2 & 1 & 0 & 0 \\
 1 & 0 & -1 & 0 & 1 & 0 \\
 -2 & 1 & 4 & 0 & 0 & 1
 \end{array}
 \begin{array}{c}
 B \\
 @ \\
 A;
 \end{array}
 C;$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{ccccc}
 0 & & & & 1 \\
 1 & -2 & 0 & -1 & 4 \\
 4 & -2 & -1 & 2 & 5 \\
 -3 & 1 & 2 & 1 & -3
 \end{array}
 \begin{array}{c}
 B \\
 @ \\
 A
 \end{array}
 \xrightarrow{\text{初等行变换}}
 \begin{array}{ccccc}
 0 & & & & 1 \\
 1 & 0 & 0 & \frac{13}{7} & \frac{54}{7} \\
 0 & 1 & 0 & \frac{10}{7} & \frac{13}{7} \\
 0 & 0 & 1 & \frac{18}{7} & -\frac{1}{7}
 \end{array}
 \begin{array}{c}
 C \\
 A;
 \end{array}$$

$$\text{以 } X = A^{-1}B = \begin{array}{ccccc}
 0 & & & & 1 \\
 \frac{13}{7} & & & & \frac{54}{7} \\
 \frac{10}{7} & & & & \frac{13}{7} \\
 \frac{18}{7} & & & & -\frac{1}{7}
 \end{array}
 \begin{array}{c}
 B \\
 @ \\
 A
 \end{array}$$

8.(1)) 构作 $\dot{Y}$ 阵

$$\begin{array}{ccccc}
 0 & & & & 1 \\
 3 & -1 & 2 & 1 & 0 & 0 \\
 1 & 0 & -1 & 0 & 1 & 0 \\
 -2 & 1 & 4 & 0 & 0 & 1
 \end{array}
 \begin{array}{c}
 B \\
 @ \\
 A
 \end{array}
 = \begin{array}{c}
 C \\
 A;
 \end{array}$$

初等行变换化左侧为单位 $\dot{Y}$ 阵，K 右侧为 A^{-1} .

习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccccc}
 0 & & & & & 1 \\
 3 & -1 & 2 & 1 & 0 & 0 \\
 1 & 0 & -1 & 0 & 1 & 0 \\
 -2 & 1 & 4 & 0 & 0 & 1
 \end{array} \xrightarrow{\text{初等行变换}} \begin{array}{cccccc}
 0 & & & & & 1 \\
 1 & 0 & 0 & \frac{1}{7} & \frac{6}{7} & \frac{1}{7} \\
 0 & 1 & 0 & -\frac{2}{7} & \frac{16}{7} & \frac{5}{7} \\
 0 & 0 & 1 & \frac{1}{7} & -\frac{1}{7} & \frac{1}{7}
 \end{array} \begin{array}{l} \\ \\ \text{A;} \\ \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccccc|c}
 0 & & & & & & 1 \\
 3 & -1 & 2 & 1 & 0 & 0 & \\
 \text{B} & & & & & & \text{C} \\
 @ & 1 & 0 & -1 & 0 & 1 & 0 \text{A} \\
 -2 & 1 & 4 & 0 & 0 & 1 &
 \end{array}
 \xrightarrow{\text{初等行变换}}
 \begin{array}{cccccc|c}
 0 & & & & & & 1 \\
 1 & 0 & 0 & \frac{1}{7} & \frac{6}{7} & \frac{1}{7} & \\
 \text{B} & & & & & & \text{C} \\
 @ & 0 & 1 & 0 & -\frac{2}{7} & 1 & \frac{16}{7} \text{A}; \\
 0 & 0 & 1 & \frac{1}{7} & -\frac{1}{7} & \frac{1}{7} &
 \end{array}$$

$$\text{以 } A^{-1} = \begin{array}{c} 0 \\ \frac{1}{7} \text{B} \\ @ \\ \text{B} \\ 1 \\ \text{B} \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccccc|c}
 0 & & & & & & 1 \\
 3 & -1 & 2 & 1 & 0 & 0 & \\
 \text{B} & & & & & & \text{C} \\
 @ & 1 & 0 & -1 & 0 & 1 & 0 \text{A} \\
 -2 & 1 & 4 & 0 & 0 & 1 &
 \end{array} \xrightarrow{\text{初等行变换}} \begin{array}{cccccc|c}
 0 & & & & & & 1 \\
 1 & 0 & 0 & \frac{1}{7} & \frac{6}{7} & \frac{1}{7} & \\
 \text{B} & & & & & & \text{C} \\
 @ & 0 & 1 & 0 & -\frac{2}{7} & \frac{16}{7} & 5\frac{5}{7} \text{A}; \\
 0 & 0 & 1 & \frac{1}{7} & -\frac{1}{7} & \frac{1}{7} &
 \end{array}$$

$$\text{以 } A^{-1} = \begin{array}{ccc|c}
 0 & & & 1 \\
 \frac{1}{7} & \frac{6}{7} & \frac{1}{7} & \\
 \text{B} & & & \text{C} \\
 @ & -\frac{2}{7} & \frac{16}{7} & 5\frac{5}{7} \text{A}, \\
 \frac{1}{7} & -\frac{1}{7} & \frac{1}{7} &
 \end{array} !$$

$$\text{以 } X = BA^{-1} = \begin{array}{ccc}
 \frac{1}{7} & \frac{20}{7} & \frac{1}{7} \\
 -\frac{8}{7} & \frac{57}{7} & \frac{20}{7}
 \end{array} .$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccccc|c}
 0 & & & & & & 1 \\
 3 & -1 & 2 & 1 & 0 & 0 & \\
 \text{B} & & & & & & \text{C} \\
 @ & 1 & 0 & -1 & 0 & 1 & 0 \text{A} \\
 -2 & 1 & 4 & 0 & 0 & 1 &
 \end{array}
 \xrightarrow{\text{初等行变换}}
 \begin{array}{cccc|c}
 0 & & & & \\
 1 & 0 & 0 & & 1 \\
 \text{B} & & & & \\
 @ & & & &
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

构E Y阵

$$A = \begin{matrix} & \begin{matrix} 0 & 1 \end{matrix} \\ \begin{matrix} 3 \\ -1 \\ -2 \\ 3 \\ -1 \end{matrix} & \begin{matrix} -1 & 2 \\ 0 & -1 \\ 1 & 4 \\ 0 & -2 \\ 4 & 1 \end{matrix} \end{matrix}$$

习题1.4($P_{39} - P_{41}$)

$$\text{构造 } \begin{matrix} A \\ B \end{matrix} \begin{matrix} \text{!} \\ @ \end{matrix} = \begin{matrix} 0 & 3 & -1 & 2 \\ 1 & 0 & -1 & 1 \\ -2 & 1 & 4 & 1 \\ 3 & 0 & -2 & 1 \\ -1 & 4 & 1 & 1 \end{matrix} \begin{matrix} 1 \\ C \\ C \\ C \\ A \end{matrix}$$

初等列变换化上 为单位 $\dot{Y}$ 阵，下侧 K 为 BA^{-1} .



习题1.4($P_{39} - P_{41}$)

构E Ę阵

$$A = \begin{pmatrix} 0 & 3 & -1 & 2 \\ 1 & 0 & -1 & 1 \\ -2 & 1 & 4 & 1 \\ 3 & 0 & -2 & 1 \end{pmatrix}$$

初等列变换化上

为单位 Ę 阵，下侧 K 为 BA^{-1} .

$$A = \begin{pmatrix} 0 & 3 & -1 & 2 \\ 1 & 0 & -1 & 1 \\ -2 & 1 & 4 & 1 \\ 3 & 0 & -2 & 1 \end{pmatrix}$$

习题1.4($P_{39} - P_{41}$)

构造E-阵 A^{-1} =

$$\begin{array}{ccc|ccc}
 & & & 0 & & 1 \\
 & & & 3 & -1 & 2 \\
 & & & 1 & 0 & -1 \\
 & & & -2 & 1 & 4 \\
 & & & 3 & 0 & -2 \\
 & & & -1 & 4 & 1
 \end{array}$$

初等列变换化为单位E-阵，下侧K为 BA^{-1} .

$$\begin{array}{ccc|ccc}
 & & & 0 & & 1 \\
 & & & 3 & -1 & 2 \\
 & & & 1 & 0 & -1 \\
 & & & -2 & 1 & 4 \\
 & & & 3 & 0 & -2 \\
 & & & -1 & 4 & 1
 \end{array}
 \xrightarrow{\text{初等列变换}}
 \begin{array}{ccc|ccc}
 & & & 0 & & 1 \\
 & & & 1 & 0 & 0 \\
 & & & 0 & 1 & 0 \\
 & & & 0 & 0 & 1 \\
 & & & \frac{1}{7} & \frac{20}{7} & \frac{1}{7} \\
 & & & -\frac{8}{7} & \frac{57}{7} & \frac{20}{7}
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\text{构E Y阵} \begin{matrix} A \\ B \end{matrix} = \begin{matrix} 0 \\ 3 \\ -1 \\ 1 \\ 0 \\ -1 \\ - \\ @ \end{matrix}$$



习题1.4($P_{39} - P_{41}$)

8.(2))



习题1.4($P_{39} - P_{41}$)

8.(2)) 先求 A^{-1} 以及 B^{-1} .



习题1.4($P_{39} - P_{41}$)8.(2)) 先求 A^{-1} 以及 B^{-1} .

$$A \quad | \quad = \begin{array}{cccc|c} & & & & ! \\ 1 & 3 & 1 & 0 & \\ 2 & 5 & 0 & 1 & \end{array} \xrightarrow{\text{初等行变换}} \begin{array}{cccc|c} & & & & ! \\ 1 & 0 & -5 & 3 & \\ 0 & 1 & 2 & -1 & \end{array} ;$$



习题1.4($P_{39} - P_{41}$)8.(2)) 先求 A^{-1} 以及 B^{-1} .

$$A \quad | \quad = \begin{array}{cccc|c} & & & & ! \\ 1 & 3 & 1 & 0 & \\ 2 & 5 & 0 & 1 & \end{array} \xrightarrow{\text{初等行变换}} \begin{array}{cccc|c} & & & & ! \\ 1 & 0 & -5 & 3 & \\ 0 & 1 & 2 & -1 & \end{array} ;$$

$$A^{-1} = \begin{array}{cc|c} & & ! \\ -5 & 3 & \\ 2 & -1 & \end{array} .$$



习题1.4($P_{39} - P_{41}$)

8.(2)) 先求 A^{-1}



习题1.4($P_{39} - P_{41}$)8.(2)) 先求 A^{-1} 以及 B^{-1} .

$$A \quad | \quad = \begin{array}{cccc|c} & & & & ! \\ 1 & 3 & 1 & 0 & \\ 2 & 5 & 0 & 1 & \end{array} \xrightarrow{\text{初等行变换}} \begin{array}{cccc|c} & & & & ! \\ 1 & 0 & -5 & 3 & \\ 0 & 1 & 2 & -1 & \end{array};$$

$$A^{-1} = \begin{array}{cc|c} & & ! \\ -5 & 3 & \\ 2 & -1 & \end{array}.$$

$$B \quad | \quad = \begin{array}{cccc|c} & & & & ! \\ 1 & 0 & 1 & 0 & \\ -1 & 1 & 0 & 1 & \end{array} \xrightarrow{\text{初等行变换}} \begin{array}{cccc|c} & & & & ! \\ 1 & 0 & 1 & 0 & \\ 0 & 1 & 1 & 1 & \end{array};$$



习题1.4($P_{39} - P_{41}$)8.(2)) 先求 A^{-1} 以及 B^{-1} .

$$A \quad | \quad = \begin{array}{cccc|c} & & & & 1 \\ 1 & 3 & 1 & 0 & \\ 2 & 5 & 0 & 1 & \end{array} \xrightarrow{\text{初等行变换}} \begin{array}{cccc|c} & & & & 1 \\ 1 & 0 & -5 & 3 & \\ 0 & 1 & 2 & -1 & \end{array};$$

$$A^{-1} = \begin{array}{cc|c} & & 1 \\ -5 & 3 & \\ 2 & -1 & \end{array}.$$

$$B \quad | \quad = \begin{array}{cccc|c} & & & & 1 \\ 1 & 0 & 1 & 0 & \\ -1 & 1 & 0 & 1 & \end{array} \xrightarrow{\text{初等行变换}} \begin{array}{cccc|c} & & & & 1 \\ 1 & 0 & 1 & 0 & \\ 0 & 1 & 1 & 1 & \end{array};$$

$$B^{-1} = \begin{array}{cc|c} & & 1 \\ 1 & 0 & \\ 1 & 1 & \end{array}.$$



习题1.4($P_{39} - P_{41}$)

以

$$X = A^{-1}CB^{-1} = \begin{pmatrix} -5 & 3 \\ 2 & -1 \end{pmatrix} \begin{pmatrix} 3 & 4 \\ 5 & 6 \end{pmatrix} \begin{pmatrix} 1 & 0 \\ 1 & 1 \end{pmatrix} = \begin{pmatrix} -2 & -2 \\ 3 & 2 \end{pmatrix}.$$



习题1.4($P_{39} - P_{41}$)

以

$$X = A^{-1}CB^{-1} = \begin{pmatrix} -5 & 3 \\ 2 & -1 \end{pmatrix} \begin{pmatrix} 3 & 4 \\ 5 & 6 \end{pmatrix} \begin{pmatrix} 1 & 0 \\ 1 & 1 \end{pmatrix} = \begin{pmatrix} -2 & -2 \\ 3 & 2 \end{pmatrix}.$$

9.)



习题1.4($P_{39} - P_{41}$)

以

$$X = A^{-1}CB^{-1} = \begin{pmatrix} -5 & 3 \\ 2 & -1 \end{pmatrix} \begin{pmatrix} 3 & 4 \\ 5 & 6 \end{pmatrix} \begin{pmatrix} 1 & 0 \\ 1 & 1 \end{pmatrix} = \begin{pmatrix} -2 & -2 \\ 3 & 2 \end{pmatrix}.$$

9.) 由 $AB = A + 2B$, 得 $(A - 2I)B = A$,



习题1.4($P_{39} - P_{41}$)

以

$$X = A^{-1}CB^{-1} = \begin{pmatrix} -5 & 3 \\ 2 & -1 \end{pmatrix} \begin{pmatrix} 3 & 4 \\ 5 & 6 \end{pmatrix} \begin{pmatrix} 1 & 0 \\ 1 & 1 \end{pmatrix} = \begin{pmatrix} -2 & -2 \\ 3 & 2 \end{pmatrix}.$$

9.) 由 $AB = A + 2B$, 得 $(A - 2I)B = A$, 若 $(A - 2I)$ 可逆, $KB = (A - 2I)^{-1}A$.



习题1.4($P_{39} - P_{41}$)

以

$$X = A^{-1}CB^{-1} = \begin{pmatrix} -5 & 3 \\ 2 & -1 \end{pmatrix} \begin{pmatrix} 3 & 4 \\ 5 & 6 \end{pmatrix} \begin{pmatrix} 1 & 0 \\ 1 & 1 \end{pmatrix} = \begin{pmatrix} -2 & -2 \\ 3 & 2 \end{pmatrix}.$$

9.) 由 $AB = A + 2B$, 得 $(A - 2I)B = A$, 若 $(A - 2I)$ 可逆, $B = (A - 2I)^{-1}A$.

构造 Y 阵

$$A - 2I \quad A = \begin{pmatrix} 0 & 1 & 0 & 1 & 3 & 0 & 1 \\ 1 & -1 & 0 & 1 & 1 & 0 & 0 \\ 0 & 1 & 2 & 0 & 1 & 4 & 1 \end{pmatrix} \begin{pmatrix} B \\ A \end{pmatrix};$$



习题1.4($P_{39} - P_{41}$)

以

$$X = A^{-1}CB^{-1} = \begin{pmatrix} -5 & 3 \\ 2 & -1 \end{pmatrix} \begin{pmatrix} 3 & 4 \\ 5 & 6 \end{pmatrix} \begin{pmatrix} 1 & 0 \\ 1 & 1 \end{pmatrix} = \begin{pmatrix} -2 & -2 \\ 3 & 2 \end{pmatrix}.$$

9.) 由 $AB = A + 2B$, 得 $(A - 2I)B = A$, 若 $(A - 2I)$ 可逆, $B = (A - 2I)^{-1}A$.

构造 $\hat{Y}$ 阵

$$A - 2I \quad A = \begin{pmatrix} 0 & 1 & 0 & 1 & 3 & 0 & 1 \\ 1 & -1 & 0 & 1 & 1 & 0 & 0 \\ 0 & 1 & 2 & 0 & 1 & 4 & 1 \end{pmatrix} \hat{Y};$$

初等行变换化左侧为单位 $\hat{Y}$ 阵, 右侧即为 $(A - 2I)^{-1}A$.



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccccc}
 & 0 & & & & 1 \\
 & 1 & 0 & 1 & 3 & 0 & 1 \\
 \text{B} & & & & & & \\
 @ & 1 & -1 & 0 & 1 & 1 & 0 \\
 & 0 & 1 & 2 & 0 & 1 & 4
 \end{array}
 \begin{array}{c}
 \\
 \\
 \text{C} \\
 \text{A}
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccccc}
 0 & & & & & 1 \\
 1 & 0 & 1 & 3 & 0 & 1 \\
 \text{B} & & & & & \text{C} \\
 @1 & -1 & 0 & 1 & 1 & 0 \text{A} \\
 0 & 1 & 2 & 0 & 1 & 4
 \end{array}
 \xrightarrow{\text{初等行变换}}
 \begin{array}{cccccc}
 0 & & & & & 1 \\
 1 & 0 & 0 & 5 & -2 & -2 \\
 \text{B} & & & & & \text{C} \\
 @0 & 1 & 0 & 4 & -3 & -2 \text{A}; \\
 0 & 0 & 1 & -2 & 2 & 3
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{c}
 \begin{array}{cccccc}
 0 & & & & & 1 \\
 1 & 0 & 1 & 3 & 0 & 1 \\
 \textcircled{B} & 1 & -1 & 0 & 1 & 1 & 0 & \textcircled{A} \\
 0 & 1 & 2 & 0 & 1 & 4
 \end{array}
 \end{array}
 \xrightarrow{\text{初等行变换}}
 \begin{array}{c}
 \begin{array}{cccccc}
 0 & & & & & 1 \\
 1 & 0 & 0 & 5 & -2 & -2 \\
 \textcircled{B} & 0 & 1 & 0 & 4 & -3 & -2 & \textcircled{A}; \\
 0 & 0 & 1 & -2 & 2 & 3
 \end{array}
 \end{array}$$

$$\text{以 } B = (A - 2I)^{-1}A = \begin{array}{c} \begin{array}{ccc} 0 & & 1 \\ 5 & -2 & -2 \\ \textcircled{B} & 4 & -3 & -2 & \textcircled{A} \\ -2 & 2 & 3 \end{array} \end{array}$$



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccccc}
 0 & & & & & 1 \\
 1 & 0 & 1 & 3 & 0 & 1 \\
 \textcircled{B} & 1 & -1 & 0 & 1 & 1 & 0 & \textcircled{C} \\
 0 & 1 & 2 & 0 & 1 & 4
 \end{array}
 \xrightarrow{\text{初等行变换}}
 \begin{array}{cccccc}
 0 & & & & & 1 \\
 1 & 0 & 0 & 5 & -2 & -2 \\
 \textcircled{B} & 0 & 1 & 0 & 4 & -3 & -2 & \textcircled{C} \\
 0 & 0 & 1 & -2 & 2 & 3
 \end{array}$$

$$\text{以 } B = (A - 2I)^{-1}A = \begin{array}{ccc}
 0 & & 1 \\
 5 & -2 & -2 \\
 \textcircled{B} & 4 & -3 & -2 & \textcircled{C} \\
 -2 & 2 & 3
 \end{array} A:$$

10.)



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccccc}
 0 & & & & & 1 \\
 1 & 0 & 1 & 3 & 0 & 1 \\
 \textcircled{B} & 1 & -1 & 0 & 1 & 0 \\
 0 & 1 & 2 & 0 & 1 & 4
 \end{array}
 \begin{array}{c}
 \textcircled{C} \\
 \textcircled{A}
 \end{array}
 \xrightarrow{\text{初等行变换}}
 \begin{array}{cccccc}
 0 & & & & & 1 \\
 1 & 0 & 0 & 5 & -2 & -2 \\
 \textcircled{B} & 0 & 1 & 0 & 4 & -3 \\
 0 & 0 & 1 & -2 & 2 & 3
 \end{array}
 \begin{array}{c}
 \textcircled{C} \\
 \textcircled{A}
 \end{array};$$

$$\text{以 } B = (A - 2I)^{-1}A = \begin{array}{cccc}
 0 & & & 1 \\
 5 & -2 & -2 & \\
 \textcircled{B} & 4 & -3 & -2 \\
 -2 & 2 & 3 &
 \end{array} \textcircled{C} \textcircled{A}:$$

10.) 由 $2A^{-1}B = B - 4I$, 得 $A(B - 4I) = 2B$,
以 $A = 2B(B - 4I)^{-1}$.



习题1.4($P_{39} - P_{41}$)

$$\begin{array}{cccccc}
 0 & & & & & 1 \\
 1 & 0 & 1 & 3 & 0 & 1 \\
 \textcircled{B} & 1 & -1 & 0 & 1 & 1 \\
 @ & 1 & -1 & 0 & 1 & 1 \\
 0 & 1 & 2 & 0 & 1 & 4
 \end{array} \xrightarrow{\text{初等行变换}} \begin{array}{cccccc}
 0 & & & & & 1 \\
 1 & 0 & 0 & 5 & -2 & -2 \\
 \textcircled{B} & 0 & 1 & 0 & 4 & -3 \\
 @ & 0 & 1 & 0 & 4 & -3 \\
 0 & 0 & 1 & -2 & 2 & 3
 \end{array} \textcircled{C};$$

$$\text{以 } B = (A - 2I)^{-1}A = \begin{array}{cccc}
 0 & & & 1 \\
 5 & -2 & -2 & \\
 @ & 4 & -3 & -2 \\
 -2 & 2 & 3 &
 \end{array} \textcircled{C}:$$

10.) 由 $2A^{-1}B = B - 4I$, 得 $A(B - 4I) = 2B$,
以 $A = 2B(B - 4I)^{-1}$.

$$| \text{用行初等变换, 求 } (B - 4I)^{-1} = \begin{array}{cccc}
 0 & & & 1 \\
 -\frac{1}{4} & \frac{1}{4} & 0 & \\
 \textcircled{B} & -\frac{1}{8} & -\frac{3}{8} & 0 \\
 @ & -\frac{1}{8} & -\frac{3}{8} & 0 \\
 0 & 0 & -\frac{1}{2} &
 \end{array} \textcircled{C}.$$

习题1.4($P_{39} - P_{41}$)

$$\text{以 } A = 2B(B - 4I)^{-1} = \begin{pmatrix} 0 & 0 & 1 \\ -1 & -1 & 0 \\ 0 & 0 & -2 \end{pmatrix} \begin{matrix} B \\ C \\ A \end{matrix}.$$



习题1.4($P_{39} - P_{41}$)

$$\text{以 } A = 2B(B - 4I)^{-1} = \begin{pmatrix} 0 & 2 & 1 \\ 0 & 0 & 0 \\ -1 & -1 & 0 \end{pmatrix}.$$

11.)



习题1.4($P_{39} - P_{41}$)

$$\text{以 } A = 2B(B - 4I)^{-1} = \begin{pmatrix} 0 & 0 & 1 \\ 0 & 2 & 0 \\ -1 & -1 & 0 \end{pmatrix}.$$

11.) 由 $AX + I = A^2 + X$,
得 $(A - I)X = A^2 - I = (A - I)(A + I)$,



习题1.4($P_{39} - P_{41}$)

$$\text{以 } A = 2B(B - 4I)^{-1} = \begin{pmatrix} 0 & 2 & 1 \\ 0 & -1 & 0 \\ 0 & 0 & -2 \end{pmatrix}.$$

11.) 由 $AX + I = A^2 + X$,
得 $(A - I)$



习题1.4($P_{39} - P_{41}$)

$$\text{以 } A = 2B(B - 4I)^{-1} = \begin{pmatrix} 0 & 0 & 1 \\ 0 & 2 & 0 \\ -1 & -1 & 0 \end{pmatrix}.$$

11.) 由 $AX + I = A^2 + X$,
得 $(A - I)$



习题1.4($P_{39} - P_{41}$)

$$\text{以 } A = 2B(B - 4I)^{-1} = \begin{pmatrix} 0 & 2 & 1 \\ 0 & -1 & 0 \\ 0 & 0 & -2 \end{pmatrix}.$$

11.) 由 $AX + I = A^2 + X$,

得 $(A - I)X = A^2 - I = (A - I)(A + I)$, 若 $(A - I)$ 可逆, 两边同时左乘 $(A - I)^{-1}$, 得 $X = A + I$.

| 用 $\hat{Y}$ 阵的行初等变换, 可以验证 $A - I$ 可逆,

$$\text{以 } X = A + I = \begin{pmatrix} 2 & 0 & 1 \\ 1 & 4 & 0 \\ 0 & 2 & 2 \end{pmatrix}.$$



习题1.4($P_{39} - P_{41}$)

$$\text{以 } A = 2B(B - 4I)^{-1} = \begin{pmatrix} 0 & 0 & 1 \\ 0 & 2 & 0 \\ -1 & -1 & 0 \end{pmatrix} \begin{matrix} B \\ C \\ A \end{matrix}.$$

11.) 由 $AX + I = A^2 + X$,
得 $(A - I)X = A^2 - I = (A - I)(A + I)$,



习题1.4($P_{39} - P_{41}$)

$$\text{以 } A = 2B(B - 4I)^{-1} = \begin{pmatrix} 0 & 0 & 1 \\ 0 & 2 & 0 \\ -1 & -1 & 0 \end{pmatrix} \begin{matrix} B \\ C \\ A \end{matrix}.$$

11.) 由 $AX + I = A^2 + X$,
得 $(A - I)X = A^2 - I = (A - I)(A + I)$,



习题1.4($P_{39} - P_{41}$)构造 $\dot{Y}$ 阵

$$A \quad I = \begin{matrix} & \begin{matrix} 0 & a & -1 & 1 & 1 & 0 & 0 \end{matrix} \\ \begin{matrix} B \\ @ \\ 1 \end{matrix} & \begin{matrix} 0 & 1 & 2 & 0 & 1 & 0 & 1 \end{matrix} \end{matrix} \quad \begin{matrix} 1 \\ C \\ A \end{matrix}$$



习题1.4($P_{39} - P_{41}$)构造 $\hat{Y}$ 阵

$$A \quad I = \begin{pmatrix} 0 & a & -1 & 1 & 1 & 0 & 0 \\ 0 & 1 & 2 & 0 & 1 & 0 & 0 \\ 1 & 0 & 3 & 0 & 0 & 0 & 1 \end{pmatrix} \begin{matrix} B \\ C \\ A \end{matrix}$$

对其？行初等行变换，从而可以得到A可以化为单位 $\hat{Y}$ 阵的条件以及 A^{-1} .



习题1.4($P_{39} - P_{41}$)构造 $\hat{Y}$ 阵

$$A \quad I = \begin{array}{c} \begin{array}{cccccc} 0 & & & & & 1 \\ a & -1 & 1 & 1 & 0 & 0 \\ 0 & 1 & 2 & 0 & 1 & 0 \\ 1 & 0 & 3 & 0 & 0 & 1 \end{array} \end{array}$$

对其行初等行变换，从而可以得到A可以化为单位 $\hat{Y}$ 阵的条件以及 A^{-1} .

$$\begin{array}{c} \begin{array}{cccccc} 0 & & & & & 1 \\ a & -1 & 1 & 1 & 0 & 0 \\ 0 & 1 & 2 & 0 & 1 & 0 \\ 1 & 0 & 3 & 0 & 0 & 1 \end{array} \end{array}$$



习题1.4($P_{39} - P_{41}$)构造 $\hat{Y}$ 阵

$$A \quad I = \begin{array}{cccccc} 0 & & & & & 1 \\ a & -1 & 1 & 1 & 0 & 0 \\ 0 & 1 & 2 & 0 & 1 & 0 \\ 1 & 0 & 3 & 0 & 0 & 1 \end{array} \begin{array}{l} B \\ C \\ A \end{array}$$

对其？行初等行变换，从而可以得到A可以化为单位 $\hat{Y}$ 阵的条件以及 A^{-1} .

$$\begin{array}{cccccc} 0 & & & & & 1 \\ a & -1 & 1 & 1 & 0 & 0 \\ 0 & 1 & 2 & 0 & 1 & 0 \\ 1 & 0 & 3 & 0 & 0 & 1 \end{array} \begin{array}{l} B \\ C \\ A \end{array} \xrightarrow{\begin{array}{l} \text{换第1、第3行} \\ \text{第1行乘}(-a)\text{加到第3行} \\ \text{第2行加到第3行} \end{array}} \begin{array}{cccccc} 0 & & & & & 1 \\ 1 & 0 & 3 & 0 & 0 & 1 \\ 0 & 1 & 2 & 0 & 1 & 0 \\ 0 & 0 & 3-3a & 1 & 1 & a \end{array} \begin{array}{l} B \\ C \\ A \end{array}$$



习题1.4($P_{39} - P_{41}$)构造 $\dot{Y}$ 阵

$$A \quad I = \begin{array}{c} \begin{array}{cccccc} 0 & & & & & 1 \\ a & -1 & 1 & 1 & 0 & 0 \\ 0 & 1 & 2 & 0 & 1 & 0 \\ 1 & 0 & 3 & 0 & 0 & 1 \end{array} \\ \begin{array}{l} B \\ @ \\ C \\ A \end{array} \end{array}$$

对其？行初等行变换，从而可以得到A可以化为单位 $\dot{Y}$ 阵的条件以及 A^{-1} .

$$\begin{array}{ccc} \begin{array}{c} 0 \\ a \quad -1 \quad 1 \quad 1 \quad 0 \quad 0 \\ B \\ @0 \quad 1 \quad 2 \quad 0 \quad 1 \quad 0 \\ 1 \quad 0 \quad 3 \quad 0 \quad 0 \quad 1 \end{array} & \begin{array}{l} \text{换第1、第3行} \\ \text{第1行乘}(-a)\text{加到第3行} \\ \longrightarrow \\ \text{第2行加到第3行} \end{array} & \begin{array}{c} 0 \\ 1 \quad 0 \quad 3 \quad 0 \quad 0 \quad 1 \\ B \\ @0 \quad 1 \quad 2 \quad 0 \quad 1 \quad 0 \\ 0 \quad 0 \quad 3-3a \quad 1 \quad 1 \quad a \end{array} \end{array}$$

由初等变换的（果可以得， A^{-1} 过初等变换可以化为单位 $\dot{Y}$ 阵的充要条件是 $3-3a \neq 0$ ，以A可逆充要条件是 $a \neq 1$ 。

习题1.4($P_{39} - P_{41}$)

3 $a \neq 1$ 时, 2 对上述 Y 阵? 一步? 行初等行变换:



习题1.4($P_{39} - P_{41}$)

$3a \neq 1$ 时, 2 对上述 Y 阵? 一步? 行初等行变换:

$$\begin{array}{l}
 \text{第3行乘 } \frac{1}{3-3a} \\
 \text{第3行乘 } (-2) \text{ 加到第2行} \\
 \longrightarrow \\
 \text{第3行乘 } (-3) \text{ 加到第1行}
 \end{array}
 \begin{array}{ccccc}
 0 & & & & 1 \\
 1 & 0 & 0 & -\frac{3}{3-3a} & -\frac{3}{3-3a} & \frac{3-6a}{3-3a} \\
 0 & 1 & 0 & -\frac{2}{3-3a} & \frac{1-3a}{3-3a} & -\frac{2a}{3-3a} \\
 0 & 0 & 1 & \frac{1}{3-3a} & \frac{1}{3-3a} & \frac{a}{3-3a}
 \end{array}
 \begin{array}{c}
 \\
 \\
 A; \\
 \\
 \end{array}$$

$$\text{以 } A^{-1} = \begin{array}{ccc}
 0 & & 1 \\
 -\frac{3}{3-3a} & -\frac{3}{3-3a} & \frac{3-6a}{3-3a} \\
 -\frac{2}{3-3a} & \frac{1-3a}{3-3a} & -\frac{2a}{3-3a} \\
 \frac{1}{3-3a} & \frac{1}{3-3a} & \frac{a}{3-3a}
 \end{array}
 \begin{array}{c}
 \\
 \\
 A: \\
 \\
 \end{array}$$



习题1.4($P_{39} - P_{41}$)

13.) 由于单位 $\mathcal{Y}$ 阵与任何可乘 $\mathcal{Y}$ 阵都可换, 而 $A^3 = 0$,
以



习题1.4($P_{39} - P_{41}$)

13.) 由于单位 I 阵与任何可乘 A 阵都可交换, 而 $A^3 = 0$,
以

$$(I + A)(I - A + A^2) = (I - A + A^2)(I + A) = I + A^3;$$

$$(I - A)(I + A + A^2) = (I + A + A^2)(I - A) = I - A^3$$





Thank you!

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