

# Solutions :-

①

(a) 
$$\begin{pmatrix} 2 & -6 & 18 \\ -4 & 10 & -38 \end{pmatrix}$$

(b) 
$$\begin{pmatrix} 1 & -3 & 9 \\ -4 & 10 & -38 \end{pmatrix}$$

↓

$$\begin{pmatrix} 1 & -3 & 9 \\ 0 & -2 & -2 \end{pmatrix}$$

↓

$$\begin{pmatrix} 1 & -3 & 9 \\ 0 & 1 & 1 \end{pmatrix}$$

(c) 
$$\begin{pmatrix} 1 & -3 & 9 \\ 0 & 1 & 1 \end{pmatrix}$$

↓

$$\begin{pmatrix} 1 & 0 & 12 \\ 0 & 1 & 1 \end{pmatrix}$$

(d)  $x = 12$

$$y = 1$$

②

$$\textcircled{a} \quad A+B = \begin{pmatrix} 2 & 2 & 3 \\ 1 & 3 & -1 \\ 6 & 3 & 2 \end{pmatrix}$$

$$\textcircled{b} \quad BA = \begin{pmatrix} -1 & 0 & 3 \\ 0 & 3 & 0 \\ 1 & -1 & 2 \end{pmatrix} \begin{pmatrix} 3 & 2 & 0 \\ 1 & 0 & -1 \\ 5 & 4 & 0 \end{pmatrix}$$

$$= \begin{pmatrix} 12 & 10 & 0 \\ 3 & 0 & -3 \\ 12 & 10 & 1 \end{pmatrix}$$

$$\textcircled{c} \quad B^T A^T = \begin{pmatrix} -1 & 0 & 1 \\ 0 & 3 & -1 \\ 3 & 0 & 2 \end{pmatrix} \begin{pmatrix} 3 & 1 & 5 \\ 2 & 0 & 4 \\ 0 & -1 & 0 \end{pmatrix}$$

$$= \begin{pmatrix} -3 & -2 & -5 \\ 6 & 1 & 12 \\ 9 & 1 & 15 \end{pmatrix}$$

③

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

↓

$$\begin{pmatrix} 15 & 10 & 0 & 5 & 0 & 0 \\ 15 & 0 & -15 & 0 & 15 & 0 \\ 15 & 12 & 0 & 0 & 0 & 3 \end{pmatrix}$$

↓

$$\begin{pmatrix} 15 & 10 & 0 & 5 & 0 & 0 \\ 0 & -10 & -15 & -5 & 15 & 0 \\ 0 & 2 & 0 & -5 & 0 & 3 \end{pmatrix}$$

↓

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

$$\downarrow$$

$$\begin{pmatrix} 3 & 0 & -3 & 0 & 3 & 0 \\ 0 & -2 & -3 & -1 & 3 & 0 \\ 0 & 0 & -3 & -6 & 3 & 3 \end{pmatrix}$$

$$\downarrow$$

$$\begin{pmatrix} 3 & 0 & 0 & 6 & 0 & -3 \\ 0 & -2 & 0 & 5 & 0 & -3 \\ 0 & 0 & -3 & -6 & 3 & 3 \end{pmatrix}$$

$$\downarrow$$

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

$$A^{-1} = \begin{pmatrix} 2 & 0 & -1 \\ -5/2 & 0 & 3/2 \\ 2 & -1 & -1 \end{pmatrix}$$

④

$$\textcircled{a} \det B = (-1) \det \begin{pmatrix} 3 & 0 \\ -1 & 2 \end{pmatrix} + 3 \det \begin{pmatrix} 0 & 3 \\ 1 & -1 \end{pmatrix}$$

$$= (-1)[6 - 0] + 3[0 - 3]$$

$$= -6 - 9 = -15$$

$$\textcircled{b} x = \frac{\det \begin{pmatrix} 1 & 0 & 3 \\ 0 & 3 & 0 \\ 0 & -1 & 2 \end{pmatrix}}{-15} = -\frac{6}{15} = -\frac{2}{5}$$

$$y = \frac{\det \begin{pmatrix} -1 & 1 & 3 \\ 0 & 0 & 0 \\ 1 & 0 & 2 \end{pmatrix}}{-15} = \frac{(-1) \times 0}{-15} = 0$$

$$z = \frac{\det \begin{pmatrix} -1 & 0 & 1 \\ 0 & 3 & 0 \\ 1 & -1 & 0 \end{pmatrix}}{-15} = \frac{1[-3]}{-15} = \frac{1}{5}$$