

## Section 3.2

$$38) \det(A^2 B^5)$$

$$= \det(A^2) \det(B^5)$$

$$= 5^2 3^5$$

$$\boxed{= 60^2 \cdot 5}$$

$$43) B^{-1} (2A) B^T$$

$$\frac{1}{\det(B)} \cdot 2 \det(A) \cdot \det(B)$$

$$\frac{1}{3} \cdot 10 \cdot 3$$

$$\boxed{= 10}$$

## Section 3.3

$$40) a) \det(A) = (-1)(1) - (-2)(4)$$

$$= -1 + 8$$

$$\boxed{= 7}$$

$$b) C_{11} = (-1)^{1+1}(1) = 1$$

$$C_{12} = (-1)^{1+2}(4) = -4$$

$$C_{21} = (-1)^{2+1}(-2) = 2$$

$$C_{22} = (-1)^{2+2}(-1) = -1$$

$$\boxed{M_C = \begin{bmatrix} 1 & -4 \\ 2 & -1 \end{bmatrix}}$$

c)  $\text{adj}(A) = M_C^T = \begin{bmatrix} 1 & 2 \\ -4 & -1 \end{bmatrix}$

d)  $A^{-1} = \frac{1}{\det(A)} \text{adj}(A) = \boxed{\begin{bmatrix} \frac{1}{7} & \frac{2}{7} \\ \frac{-4}{7} & \frac{-1}{7} \end{bmatrix}}$

42) a)  $\det(A)$

$$= 2 \begin{vmatrix} 1 & 5 \\ -1 & 2 \end{vmatrix} - (-3) \begin{vmatrix} 2 & 5 \\ 0 & 2 \end{vmatrix} + 0 \begin{vmatrix} 2 & 1 \\ 0 & -1 \end{vmatrix}$$

$$= 2(7) + 3(4) + 0 \boxed{= 26}$$

b)  $C_{11} = 7 \quad C_{21} = \begin{vmatrix} -3 & 0 \\ -1 & 2 \end{vmatrix} = 6$

$$C_{12} = -4 \quad C_{22} = \begin{vmatrix} 2 & 0 \\ 0 & 2 \end{vmatrix} = 4$$

$$C_{13} = \begin{vmatrix} 2 & 1 \\ 0 & -1 \end{vmatrix} = -2 \quad C_{23} = \begin{vmatrix} 2 & -3 \\ 0 & -1 \end{vmatrix} = 2$$

$$C_{31} = \begin{vmatrix} -3 & 0 \\ 1 & 5 \end{vmatrix} = -15$$

$$C_{32} = \begin{vmatrix} 2 & 0 \\ 2 & 5 \end{vmatrix} = -10$$

$$C_{33} = \begin{vmatrix} 2 & -3 \\ 2 & 1 \end{vmatrix} = 8$$

$$\begin{bmatrix} 7 & -4 & -2 \\ 6 & 4 & 2 \\ -15 & -10 & 8 \end{bmatrix}$$

$$c) M_C^T = \begin{bmatrix} 7 & 6 & -15 \\ -4 & 4 & -10 \\ -2 & 2 & 8 \end{bmatrix}$$

$$d) \frac{1}{\det(A)} \text{adj}(A) = \begin{bmatrix} \frac{7}{26} & \frac{6}{26} & \frac{-15}{26} \\ -\frac{4}{26} & \frac{4}{26} & \frac{-10}{26} \\ -\frac{2}{26} & \frac{2}{26} & \frac{8}{26} \end{bmatrix}$$

$$43) a) -2 \begin{vmatrix} 1 & 5 \\ 2 & 3 \end{vmatrix} - 3 \begin{vmatrix} 2 & 5 \\ 0 & 3 \end{vmatrix} - 1 \begin{vmatrix} 2 & 1 \\ 0 & 2 \end{vmatrix}$$

$$= -2(-7) - 3(6) - 1(4)$$

$$\boxed{= -8}$$

$$b) C_{11} = \begin{vmatrix} 1 & 5 \\ 2 & 3 \end{vmatrix} = -7 \quad C_{12} = - \begin{vmatrix} 2 & 5 \\ 0 & 3 \end{vmatrix} = -6$$

$$C_{13} = \begin{vmatrix} 2 & 1 \\ 0 & 2 \end{vmatrix} = 4 \quad C_{21} = - \begin{vmatrix} 3 & -1 \\ 2 & 3 \end{vmatrix} = -11$$

$$C_{22} = \begin{vmatrix} -2 & -1 \\ 0 & 1 \end{vmatrix} = -6 \quad C_{23} = - \begin{vmatrix} -2 & 3 \\ 0 & 2 \end{vmatrix} = 4$$

$$C_{31} = \begin{vmatrix} 3 & -1 \\ 1 & 5 \end{vmatrix} = 16 \quad C_{32} = - \begin{vmatrix} -2 & -1 \\ 2 & 5 \end{vmatrix} = 8$$

$$C_{33} = \begin{vmatrix} -2 & 3 \\ 2 & 1 \end{vmatrix} = -8$$

$$M_C = \begin{bmatrix} -7 & -6 & 4 \\ 11 & -6 & 4 \\ 16 & 8 & -8 \end{bmatrix}$$

$$c) M_C^T = \begin{bmatrix} -7 & -11 & 16 \\ -6 & -6 & 8 \\ -4 & 4 & -8 \end{bmatrix}$$

$$d) \frac{1}{\det(A)} \text{adj}(A) = \begin{bmatrix} \frac{7}{18} & \frac{11}{18} & -\frac{2}{3} \\ \frac{6}{18} & \frac{6}{18} & 1 \\ -\frac{1}{12} & -\frac{1}{12} & 1 \end{bmatrix}$$

$$\begin{aligned} 52) \quad \det(A) &= 2 \begin{vmatrix} 1 & 0 & 0 \\ -1 & 0 & 0 \\ 0 & -1 & 1 \end{vmatrix} \\ &= 2(1) - 0 - 1(-5) \\ &= 7 \end{aligned}$$

$$C_{13} = (-1)^{1+3} \begin{vmatrix} 2 & 1 \\ 3 & -1 \end{vmatrix} = -5$$

$$(A^{-1})_{31} = \boxed{\frac{-5}{7}}$$

$$59) \quad x_1 = \frac{D_1}{D} \quad x_2 = \frac{D_2}{D}$$

$$D = \det \begin{bmatrix} 2 & -3 \\ 1 & 2 \end{bmatrix}$$

$$= (2)(2) - (-3)(1)$$

$$= 4 + 3 = 7$$

$$D_1 = \det \begin{bmatrix} 2 & -3 \\ 4 & 2 \end{bmatrix}$$

$$= 4 + 12$$

$$= 16$$

$$D_2 = \det \begin{bmatrix} 2 & 2 \\ 1 & 4 \end{bmatrix}$$

$$= 8 - 2$$

$$= 6$$

$$x_1 = \frac{16}{7}$$

$$x_2 = \frac{6}{7}$$

$$62) \quad x_1 = \frac{D_1}{D} \quad x_2 = \frac{D_2}{D} \quad x_3 = \frac{D_3}{D}$$

$$D = \det \begin{bmatrix} 3 & -2 & 3 \\ 1 & 1 & -1 \\ 1 & 0 & 1 \end{bmatrix}$$

$$= 3 \begin{vmatrix} 1 & -1 \\ 0 & 1 \end{vmatrix} - (-2) \begin{vmatrix} 1 & -1 \\ 1 & 1 \end{vmatrix} + 1 \begin{vmatrix} 1 & 1 \\ 1 & 0 \end{vmatrix}$$
$$= 3(1) + 2(2) + 1(-1) = 6$$

$$D_1 = 4 \begin{vmatrix} 1 & -1 \\ 0 & 1 \end{vmatrix} - (-2) \begin{vmatrix} 2 & -1 \\ 1 & 1 \end{vmatrix} + 1 \begin{vmatrix} 2 & 1 \\ 1 & 0 \end{vmatrix}$$

$$= 9$$

$$D_2 = 3 \begin{vmatrix} 2 & -1 \\ 1 & 1 \end{vmatrix} - 4 \begin{vmatrix} 1 & -1 \\ 1 & 1 \end{vmatrix} + 1 \begin{vmatrix} 1 & 2 \\ 1 & 1 \end{vmatrix}$$
$$= 0$$

$$D_3 = 3 \begin{vmatrix} 1 & 2 \\ 0 & 1 \end{vmatrix} - (-2) \begin{vmatrix} 1 & 2 \\ 1 & 1 \end{vmatrix} + 4 \begin{vmatrix} 1 & 1 \\ 1 & 0 \end{vmatrix}$$
$$= 3$$

$$x_1 = \frac{9}{6} = \frac{3}{2}$$

$$x_2 = 0$$

$$x_3 = \frac{3}{6} = \frac{1}{2}$$