

ACDA 4008 PAPERT Solutions 2024/25

Q1 (i) $5x + y - 2z - 3x - 4y + z + 2x - y + 3z$
 $= \underline{4x - 4y + 2z}$ [5]

(ii) $2x(x+3) - x(x+6)$
 $= 2x^2 + 6x - x^2 - 6x$
 $= \underline{x^2}$ [5]

(iii) $2p^4q^1r^1 \times 3p^1q^2 \times 4p^1r^4$
 $= \underline{24p^6q^3r^5}$ [5]

(iv) $\frac{12p^5q^1r^1}{3p^3q^2r^{-2}} = 4p^2q^{-1}r^3$ [5]

$$v) \frac{f'g}{4h} \times \frac{gh^2}{fh} \times \frac{8f'h^3}{2f^3}$$

$$= \frac{8f^2g^2h^5}{8f^4h^2}$$

$$= \underline{f^{-2}g^2h^3}$$

[5]

Q2 i) $3(x+2) = 2(x-4)$

$$3x + 6 = 2x - 8$$

$$3x - 2x = -8 - 6$$

$$\underline{x = -14}$$

[8]

$$2ii) \quad \frac{(x-3)}{3} = x + \frac{(x+2)}{6}$$

Multiply Through by 6 $\Rightarrow$

$$2 \cancel{6} \frac{(x-3)}{\cancel{3}} = 6x + \cancel{6} \frac{(x+2)}{\cancel{6}}$$

$$2(x-3) = 6x + (x+2)$$

$$2x - 6 = 6x + x + 2$$

$$2x - 6 = 7x + 2$$

$$-8 = 5x$$

$$\frac{-8}{5} = x$$

[12]

Q3
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$$4x + 2y = 2 \text{ — (A)}$$

$$2x - 5y = 7 \text{ — (B) } \times 2$$

$$4x + 2y = 2 \text{ — (A)}$$

$$\text{— } 4x - 10y = 14 \text{ — (C)}$$

Subtract

$$12y = -12$$

$$y = \frac{-12}{12}$$

$$y = -1$$

Substitute $y = -1$ in (A)

$$4x + 2(-1) = 2$$

$$4x - 2 = 2$$

$$4x = 4$$

$$x = 4/4$$

$$\underline{x = 1}$$

[10]

Q.4

$$A = \begin{bmatrix} 1 & 0 & 2 \\ 1 & -1 & 1 \\ 1 & 2 & -1 \end{bmatrix}$$

Determinant of A

$$|A| = +1 \begin{vmatrix} -1 & 1 \\ 2 & -1 \end{vmatrix} - 0 \begin{vmatrix} 1 & 1 \\ 1 & -1 \end{vmatrix} + 2 \begin{vmatrix} 1 & -1 \\ 1 & 2 \end{vmatrix}$$

$$= +1(1-2) - 0 + 2(2-(-1))$$

$$= 1(-1) - 0 + 2(3)$$

$$= -1 + 6$$

$$\underline{|A| = 5}$$

Matrix of Co-factors - C

$$C = \begin{bmatrix} + \begin{vmatrix} -1 & 1 \\ 2 & -1 \end{vmatrix} & - \begin{vmatrix} 1 & 1 \\ 1 & -1 \end{vmatrix} & + \begin{vmatrix} 1 & -1 \\ 1 & 2 \end{vmatrix} \\ - \begin{vmatrix} 0 & 2 \\ 2 & -1 \end{vmatrix} & + \begin{vmatrix} 1 & 2 \\ 1 & -1 \end{vmatrix} & - \begin{vmatrix} 1 & 0 \\ 1 & 2 \end{vmatrix} \\ + \begin{vmatrix} 0 & 2 \\ -1 & 1 \end{vmatrix} & - \begin{vmatrix} 1 & 2 \\ 1 & 1 \end{vmatrix} & + \begin{vmatrix} 1 & 0 \\ 1 & -1 \end{vmatrix} \end{bmatrix}$$

$$C = \begin{bmatrix} -1 & 2 & 3 \\ 4 & -3 & -2 \\ 2 & 1 & -1 \end{bmatrix}$$

The Transpose of C

$$C^T = \begin{bmatrix} -1 & 4 & 2 \\ 2 & -3 & 1 \\ 3 & -2 & -1 \end{bmatrix}$$

The Inverse Matrix - A^{-1}

$$A^{-1} = \frac{1}{|A|} \cdot C^T$$

$$A^{-1} = \frac{1}{5} \begin{bmatrix} -1 & 4 & 2 \\ 2 & -3 & 1 \\ 3 & -2 & -1 \end{bmatrix}$$

[15]

Q5

$$x + 0y + 2z = -2$$

$$x - y + z = -2$$

$$x + 2y - z = 3$$

Write in Matrix form $\Rightarrow$

$$\begin{bmatrix} 1 & 0 & 2 \\ 1 & -1 & 1 \\ 1 & 2 & -1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -2 \\ -2 \\ 3 \end{bmatrix}$$

$$A \underline{x} = \underline{b}$$

$$\Rightarrow A^{-1} A \underline{x} = A^{-1} \underline{b}$$

$$I \underline{x} = A^{-1} \underline{b}$$

$$\underline{x} = A^{-1} \underline{b}$$

$$A^{-1} = \frac{1}{5} \begin{bmatrix} -1 & 4 & 2 \\ 2 & -3 & 1 \\ 3 & -2 & -1 \end{bmatrix}$$

$$-X = \frac{1}{5} \begin{bmatrix} -1 & 4 & 2 \\ 2 & -3 & 1 \\ 3 & -2 & -1 \end{bmatrix} \begin{bmatrix} -2 \\ -2 \\ 3 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \frac{1}{5} \begin{bmatrix} 2 - 8 + 6 \\ -4 + 6 + 3 \\ -6 + 4 - 3 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \\ -1 \end{bmatrix}$$

[10]

$$\underline{Q6} \quad f(x) = \frac{2x+5}{x^2+5x+6}$$

$$= \frac{2x+5}{(x+2)(x+3)}$$

$$\frac{2x+5}{(x+2)(x+3)} = \frac{A}{(x+2)} + \frac{B}{(x+3)}$$

Multiply Through by Denominator $\Rightarrow$

$$2x+5 = A(x+3) + B(x+2)$$

$$\underline{\text{let } x = -2}$$

$$2(-2)+5 = A(-2+3)$$

$$-4+5 = A(1)$$

$$\underline{1 = A}$$

$$\underline{\text{let } x = -3}$$

$$2(-3)+5 = B(-3+2)$$

$$-6+5 = B(-1)$$

$$-1 = B(-1)$$

$$\underline{1 = B}$$

$$\therefore \frac{2x+5}{(x+2)(x+3)} = \frac{1}{(x+2)} + \frac{1}{(x+3)}$$

[20]

