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Examiner Only

$$-4y + 2z$$

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5



Examination Answer Books

12 Pages

Instructions to Candidates

1. Please give the information requested in the boxes below.
2. Enter your name in the space provided to the right, fold over and seal down (using the label provided) to hide your name.
3. The answers must be legibly written. The Examiners can either ignore illegible script or have it typed and the expense of typing charged to the candidate.
4. Write your answers in ink.
5. Begin each answer on a fresh page. Do all rough work in the answer book and cross it through.
6. No part of this book is to be torn out; it must be handed in complete.
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1	Student Number	2420823
2	Title of Examination Paper	Mathematics exam Paper 1
3	Module Code	ALBA 4008
4	Date and Time of Examination	6/1/25 9:00
5	Examination Venue	IA 310
6	Seat Number	037
7	Number of Answer Books handed in	1

[illegible]

99%

McLellan

✓ GT Feb 25

1)

$$a) 5x - 3x + 2x + y - 4y - y - 2z + 2 + 3z = 4x - 4y + 2z \quad \checkmark$$

$$b) 2x^2 + 6x - (x^2 + 6x) = x^2 \quad \checkmark$$

$$c) 24p^6q^3r^5 \quad \checkmark$$

$$d) 4p^2q^{-1}r^3 \quad \checkmark$$

$$e) \frac{8f^2g^2h^5}{8f^4h^2} = \frac{f^2g^2h^3}{f^2} = f^{-2}g^2h^3 \quad \checkmark$$

$$2) a) \begin{aligned} 3x + 6 &= 2x - 8 \\ x + 6 &= -8 \\ x &= -14 \end{aligned} \quad \checkmark$$

$$b) \begin{aligned} 2(x-3) &= 6x + (x+2) \\ 2x - 6 &= 7x + 2 \\ -6 &= 5x + 2 \\ -8 &= 5x \\ x &= -8/5 \end{aligned} \quad \checkmark$$

$$a) \begin{aligned} 3(-14+2) &= 2(-14-4) \\ 3(-12) &= 2(-18) \\ -36 &= -36 \end{aligned}$$

$$b) 2(-8/5-3) = 6(-8/5)$$

$$\frac{(-8/5-3)}{3} = \frac{-8/5 + (-8/5+2)}{6}$$

$$\frac{(-1.6-3)}{3} = \frac{-1.6 + (-1.6+2)}{6}$$

$$-23/15 = -23/15$$

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8

12

$$3) \begin{cases} 4x+2y=2 & (A) \\ 2x-5y=7 & (B) \end{cases}$$

$$\begin{array}{r} 4x+2y=2 & (A) \\ -4x-10y=14 & (2B) \\ \hline 0x+12y=-12 \\ 12y=-12 \\ y=-1 \end{array}$$

Sub $y=-1$ into A

$$\begin{aligned} 4x+2(-1) &= 2 \\ 4x-2 &= 2 \\ 4x &= 4 \\ x &= 1 \end{aligned}$$

Sub $x=1$ and $y=-1$ into B.

$$\begin{aligned} 2(1)-5(-1) &= 7 \\ 2+5 &= 7 \\ 7 &= 7 \\ \therefore x=1, y=-1. \end{aligned}$$

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$$6) f(x) = \frac{2x+5}{x^2+5x+6} = \frac{2x+5}{(x+3)(x+2)} = \frac{A}{(x+3)} + \frac{B}{(x+2)}$$

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

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

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

$$-4+5 = A(0) + B(1)$$

$$1 = B$$

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

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

$$-6+5 = A(-1) + B(0)$$

$$-1 = -A$$

$$A = 1$$

$$\therefore A=1, B=1$$

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

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

$$f(x) = \frac{2x+5}{(x^2+5x+6)} = \frac{1}{x+3} + \frac{1}{x+2}$$

$$\frac{2x+5}{x^2+5x+6}$$

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$$\begin{bmatrix} + & - & + \\ - & + & - \\ + & - & + \end{bmatrix}$$

Question No.

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$$4) A = \begin{bmatrix} 1 & 0 & 2 \\ 1 & -1 & 1 \\ 1 & 2 & -1 \end{bmatrix}$$

determinant, $|A|$:

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

$$= 1 \{ (-1 \times -1) - (2 \times 1) \} - 0 + 2 \{ (1 \times 2) - (1 \times -1) \}$$

$$= 1 \{ 1 - 2 \} + 2 \{ 2 - -1 \}$$

$$|A| = 1 \{ -1 \} + 2 \{ 3 \}$$

$$= -1 + 6$$

$$|A| = 5$$

inverse, A^{-1} :

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

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

$$C = \begin{bmatrix} +\{(-1 \times -1) - (2 \times 1)\} & -\{(1 \times -1) - (1 \times 1)\} & +\{(1 \times 2) - (1 \times -1)\} \\ -\{(0 \times -1) - (2 \times 2)\} & +\{(1 \times -1) - (1 \times 2)\} & -\{(1 \times 2) - (1 \times 0)\} \\ +\{(0 \times -1) - (-1 \times 2)\} & -\{(1 \times 1) - (1 \times 2)\} & +\{(1 \times -1) - (1 \times 0)\} \end{bmatrix}$$

$$= \begin{bmatrix} +\{1 - 2\} & -\{-1 - 1\} & +\{2 - -1\} \\ -\{0 - 4\} & +\{-1 - 2\} & -\{2 - 0\} \\ +\{0 - -2\} & -\{1 - 2\} & +\{-1 - 0\} \end{bmatrix}$$

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

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

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

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

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$$5) \underline{AX=B} \quad \underline{X=A^{-1}B}$$

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

$$x = \frac{1}{5} \{ (-1 \times -2) + (4 \times -2) + (2 \times 3) \} = \frac{1}{5} \{ 2 - 8 + 6 \} \\ = \frac{1}{5} (8 - 8) = \frac{1}{5} (0) = 0.$$

$$y = \frac{1}{5} \{ (2 \times -2) + (-3 \times -2) + (1 \times 3) \} = \frac{1}{5} \{ -4 + 6 + 3 \} \\ = \frac{1}{5} \{ -4 + 9 \} = \frac{1}{5} (5) = 1$$

$$z = \frac{1}{5} \{ (3 \times -2) + (-2 \times -2) + (-1 \times 3) \} = \frac{1}{5} \{ -6 + 4 - 3 \} \\ = \frac{1}{5} \{ -9 + 4 \} = \frac{1}{5} (-5) = -1$$

$$\therefore x=0, y=1, z=-1$$

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

(A) ✓

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

(B) ✓

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

(C) ✓

$$\therefore x=0, y=1, z=-1.$$

just me &
checking
now!

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