

SURNAME: Evans

FORENAME(S): Abed

12 Pages

1. Please give the information requested in the boxes below.
2. Enter your name in the space provided to the right of the cover and seal down (using the label provided) to hide your name.
3. The answers must be legibly written. The Examiner will 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.
7. If more books than one are used, fasten them together using the tags available from the invigilator(s).
8. **Every book must be handed in. In no circumstances may answer books, used or unused, be taken out of the examination venue.**

1	Student Number	1204278
2	Title of Examination Paper	Mathematics
3	Module Code	ACDB4003
4	Date and Time of Examination	9:30 12/05/26
5	Examination Venue	310 IQ
6	Seat Number	4
7	Number of Answer Books handed in	1

[illegible]

(Gweler yr ochr arall am y fersiwn Cymraeg)

1

i $3x + 4y - z - 2x - 3y + 2z + x + 4z$

$$3x + x + 4y - 3y - z + 4z$$

$$= 4x + y - 5z$$

①

ii $x(x+4) - (x-3)$

$$x^2 + 4x - (x-3)$$

$$x^2 + 4x - x + 3$$

$$= x^2 + 3x + 3$$

✓ Careless here.

①

iii) $p^3 q r \times 2 p q^4 \times 4 q r^2$

$$2 \times 4 = 8$$

$$p^{3+1} = p^4$$

$$q^{1+4+1} = q^6$$

$$r^{1+2} = r^3$$

$$= 8 p^4 q^6 r^3$$

②

iv) $\frac{48 p^2 q^3 r}{12 p q r^{-3}}$

$$48 / 12 = 4$$

$$p^{2-1} = p$$

$$q^{3-1} = q^2$$

$$r^{1-(-3)} = r^4$$

$$= 4 p q^2 r^4$$

②

$$v) \quad \frac{fg}{16h} \times \frac{gh^3}{4fh} \times \frac{32fh^5}{f^4}$$

$$32 = 32$$

$$g^{1+1} = g^2$$

$$f^{1+1} = f^2$$

$$h^{3+5} = h^8$$

$$16 \times 4 = 64$$

$$h^{1+1} = h^2$$

$$f^{1+4} = f^5$$

$$\frac{32 g^2 f^2 h^8}{64 h^2 f^5}$$

$$32/64 = \frac{1}{2}$$

$$g^2 = g^2$$

$$f^{2-5} = f^{-3}$$

$$h^{8-2} = h^6$$

$$\frac{1}{2} g^2 f^{-3} h^6$$

2)

i)

$$x^2 + 7x = -12$$

$$x^2 + 7x + 12 = -12 + 12$$

$$x^2 + 7x + 12 = 0$$

$$? + ? = 7$$

$$3 + 4 = 7$$

$$? \times ? = 12$$

$$3 \times 4 = 12$$

$$(x+3)(x+4) = 0$$

$$\text{Either } x+3 = 0 \text{ or } x+4 = 0$$

$$x+3-3 = 0-3$$

$$x = -3$$

$$x+4-4 = 0-4$$

$$x = -4$$

$$x = -3 \text{ or } x = -4$$

good.

5

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

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

$$x^{\frac{3}{2}} - 3 = 2x + 1$$

$$x^{\frac{3}{2}} - 3 - 1 = 2x + 1 - 1$$

$$x^{\frac{3}{2}} - 4 = 2x$$

$$\text{Ans} \quad \cancel{4}$$

$$x^{\frac{3}{2}} - x^{\frac{3}{2}} - 4 = 2x - x^{\frac{3}{2}}$$

$$-4 = 2x - x^{\frac{3}{2}}$$

Mult b.s-by 6

or cross multiply

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

$$\Rightarrow x = -1$$

①

5)

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

$$111 = 3 \begin{vmatrix} -1 & 2 \\ -3 & -4 \end{vmatrix} - 2 \begin{vmatrix} 2 & 2 \\ 1 & -4 \end{vmatrix} + 1 \begin{vmatrix} 2 & -1 \\ 1 & -3 \end{vmatrix}$$

determinants
not Brackets

$$3(4 - (-6)) - 2(-8 - 2) + 1(-6 - (-1))$$

$$3(10) - 2(-10) + 1(-5)$$

$$30 + 20 - 5 = 45$$

$$= 45$$

etc as above

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

$$C = \begin{bmatrix} 10 & 10 & -5 \\ 5 & -13 & 11 \\ 5 & -4 & -7 \end{bmatrix}$$

$$C^T = \begin{bmatrix} 10 & 5 & 5 \\ 10 & -13 & -4 \\ -5 & 11 & -7 \end{bmatrix}$$

$$A^{-1} = \frac{1}{45} \begin{bmatrix} 10 & 5 & 5 \\ 10 & -13 & -4 \\ -5 & 11 & -7 \end{bmatrix}$$

$$6) \quad \begin{bmatrix} 10 & 5 & 5 \\ 10 & -13 & -4 \\ -5 & 11 & -7 \end{bmatrix} \begin{bmatrix} 6 \\ 3 \\ -6 \end{bmatrix}$$

$$10 \times 6 = 60$$

$$10 \times 6 = 60$$

$$-5 \times 6 = -30$$

$$\frac{1}{45} \begin{bmatrix} 60 & 15 & 30 \\ 60 & 39 & 24 \\ -30 & 33 & 42 \end{bmatrix} = \begin{bmatrix} 45 \\ 45 \\ -45 \end{bmatrix} \cdot \frac{1}{45}$$

$$5 \times 3 = 15$$

$$-13 \times 3 = -39$$

$$11 \times 3 = 33$$

$$5 \times -6 = -30$$

$$-4 \times -6 = 24$$

$$-7 \times -6 = 42$$

$$\begin{aligned} x &= 1 \\ y &= 1 \\ z &= 1 \end{aligned}$$

write system in form

$$AX = b$$

$$\Rightarrow A^T AX = A^T b$$

$$\Rightarrow \underline{X} = A^{-T} \underline{b}$$

14

6

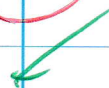
7)

i) $\frac{dy}{dx} = 4(x^{-1})$

$$\frac{dy}{dx} = 4(1) \checkmark$$

$$\frac{dy}{dx} = 4 \checkmark$$

2



ii) $\frac{dy}{dx} = x^{-1} + 8x^{\frac{1}{2}}$

$$= x^{-1} + 8(\frac{1}{2}(x^{\frac{1}{2}-1}))$$

$$= x^{-1} + 8(\frac{1}{2}(x^{-\frac{1}{2}}))$$

$$\frac{dy}{dx} = x^{-1} + 4x^{-\frac{1}{2}} \checkmark$$

1



iii) $= 4x^{-1} + 7x^3 \checkmark$

$$= 4x^{-1} + 7(3x^{3-1})$$

$$= 4x^{-1} + 7(3x^2) \checkmark$$

$$\frac{dy}{dx} = 4x^{-1} + 21x^2 \checkmark$$

1



iv) $\frac{dy}{dx} = k \cos(2x)$

$$k = 2$$

1



$$v) \quad \frac{dy}{dx} = (x^3 \cdot -\sin(x)) + (\cos(x) \cdot (3x^{3-1}))$$

$$= x^2(-x \sin x + 3 \cos x)$$

2

$$\frac{dy}{dx} = (3x^2 \cdot -\sin(x)) + (\cos(x) \cdot (3x^2))$$

$$vii) \quad \frac{dy}{dx} = e^x + \frac{1}{x} - 3$$

$$\frac{dy}{dx} = e^x + \frac{1}{x}$$

3

This is quite a good result!