



12 Pages

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1	Student Number	2311418
2	Title of Examination Paper	Mathematics Paper 1
3	Module Code	ACDA4008
4	Date and Time of Examination	9/1/2024 09:00
5	Examination Venue	UWTSP 1Q310
6	Seat Number	058
7	Number of Answer Books handed in	1

[illegible]

88%
Good

i) $5x - 12y + 6z$ ✓

Cancel here!

ii) $x^2 + 3x - x^2 + 4x = 7x$

iii) $48p^3q^5r^3$ ✓

iv) ~~3p^2q^2r^3~~ ✓

v)
$$\begin{array}{r} 32 \\ \times 8 \\ \hline 256 \end{array}$$

~~256~~

$$\frac{256 s^2 g^2 h^5}{768 s^4 h^2} =$$

~~16~~

$$\begin{array}{r} 16 \\ \times 12 \\ \hline 32 \\ 160 \\ \hline 192 \end{array}$$

$$\begin{array}{r} 192 \\ \times 4 \\ \hline 768 \end{array}$$

$$\frac{256 s^{-2} g^2 h^3}{768}$$

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

$$\begin{array}{r} 256 \\ \times 3 \\ \hline 768 \end{array}$$

2i)

$5(x+3) = 2(x-8)$

$5x + 15 = 2x - 16$

$5x + 31 = 2x$

$31 = -3x$

~~31 = -3x~~

$3x = -31$

$x = \frac{-31}{3}$

2ii)

$$\frac{(x-3)}{4} = x + \frac{(3x+4)}{8}$$

$-6x - 6 = 3x + 4$

$-6x = 3x + 10$

$-9x = 10$

$x = -\frac{10}{9}$

$x = -0.9$

Easier to
x 8

$x - 3 = 4\left(x + \frac{3x+4}{8}\right)$

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

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

X. NO!

3)

① $2x + 4y = 6$

② $3x - 5y = -2$

① $6x + 12y = 18$

② $6x - 10y = -4$

$$① - ② \Rightarrow 22y = 22$$

$$y = 1$$

$$x = 1$$

$$y = 1$$

$$2x + 4(1) = 6$$

$$2x = 2$$

$$x = 1$$

4)

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

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

$$|A| = 1 \begin{vmatrix} -1 & 2 \\ 2 & 1 \end{vmatrix} - 2 \begin{vmatrix} 2 & 2 \\ 3 & 1 \end{vmatrix} + 3 \begin{vmatrix} 2 & -1 \\ 3 & 2 \end{vmatrix}$$

$$|A| = -5 - 2(-4) + 3(7)$$

$$|A| = -5 + 8 + 21$$

$$|A| = 24$$

$$A^{-1} = \frac{1}{24} \begin{bmatrix} 1 & 2 & 3 \\ 2 & -1 & 2 \\ 3 & 2 & 1 \end{bmatrix}$$

5)

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

$$X A^{-1}$$

show why write as

$$A X = b$$

$$A^{-1} A X = A^{-1} b$$

$$\Rightarrow X = A^{-1} b$$

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \frac{1}{24} \begin{bmatrix} (-5 \times 2) + (4 \times 5) + (2 \times 7) \\ (4 \times 2) + (-8 \times 5) + (2 \times 4) \\ (7 \times 2) + (4 \times 5) + (2 \times -5) \end{bmatrix}$$

$$\rightarrow 4) \left[\begin{array}{c} + \begin{vmatrix} -1 & 2 \\ 2 & 1 \end{vmatrix} - \begin{vmatrix} 2 & 2 \\ 3 & 1 \end{vmatrix} + \begin{vmatrix} 2 & -1 \\ 3 & 2 \end{vmatrix} \\ - \begin{vmatrix} 2 & 3 \\ 2 & 1 \end{vmatrix} + \begin{vmatrix} 1 & 3 \\ 3 & 1 \end{vmatrix} - \begin{vmatrix} 1 & 2 \\ 3 & 2 \end{vmatrix} \\ + \begin{vmatrix} 2 & 3 \\ -1 & 2 \end{vmatrix} - \begin{vmatrix} 1 & 3 \\ 2 & 2 \end{vmatrix} + \begin{vmatrix} 1 & 2 \\ 2 & -1 \end{vmatrix} \end{array} \right] = \begin{bmatrix} -5 & +4 & +7 \\ +4 & -8 & +4 \\ +7 & +4 & -5 \end{bmatrix}$$

$$A^{-1} = \frac{1}{24} \begin{bmatrix} -5 & 4 & 7 \\ 4 & -8 & 4 \\ 7 & 4 & -5 \end{bmatrix}$$

$$\rightarrow 5) \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \frac{1}{24} \begin{bmatrix} -10 + 20 + 14 \\ 8 + -40 + 8 \\ 14 + 20 + -10 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \frac{1}{24} \begin{bmatrix} 24 \\ -24 \\ 24 \end{bmatrix} \quad \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ -1 \\ 1 \end{bmatrix}$$

$$x=1 \quad y=-1 \quad z=1$$

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

$$f(x) = \frac{A}{(x+3)} + \frac{B}{(x-1)}$$

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

$$\text{let } x=1$$

$$1+2 = A(1-1) + B(1+3)$$

$$3 = 4B$$

$$B = \frac{3}{4}$$

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

$$-3+2 = A(-3+1) + B(-3+3)$$

$$-1 = -2A$$

$$A = \frac{1}{2}$$

$$f(x) = \frac{\left(\frac{1}{2}\right)}{(x+3)} + \frac{\frac{3}{4}}{(x-1)}$$

ecf

This is a good effort Bailey,
Very well Done!



Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

ONE

Complete, fold and seal
(see *note 2* below)

SURNAME: Freeman

FORENAME(S): Bailey

Examination Answer Books

12 Pages

Instructions to Candidates

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1	Student Number	2311418
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3	Module Code	ACDA4008
4	Date and Time of Examination	11/1/2024 15:00
5	Examination Venue	1A310
6	Seat Number	057
7	Number of Answer Books handed in	1

[illegible]

52%

(Gweler yr ochr arall am y fersiwn Cymraeg)

$$1 \text{ ai) } \frac{dy}{dx} = 24x^2$$

(2)

$$1 \text{ aii) } \frac{dy}{dx} = 12x^2 + 5x^{-\frac{1}{2}}$$

(3)

$$1 \text{ aiii) } \frac{dy}{dx} = -10x^{-6} + 2x \times 3x^2$$

(2)

$$1 \text{ av) } y = x^2 \cos(x) \quad \frac{dy}{dx} = u \cdot \frac{dv}{dx} + v \cdot \frac{du}{dx}$$

$$u = x^2 \quad v = \cos(x)$$

$$du = 2x \quad dv = -\sin(x)$$

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

$$= x(2\cos(x) - x\sin(x))$$

(4)

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

(2)

$$1 \text{ div) } \frac{dy}{dx} = 5 \cos(5x)$$

$$1 \text{ avi) } y = (9x+3)^{10} \quad y = u^{10}$$

$$u = 9x+3$$

$$\frac{dy}{dx} = 90u^9$$

$$\frac{dy}{du} = 10u^9$$

$$\frac{du}{dx} = 9$$

$$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$$

$$= 90(9x+3)^9$$

(2)

$$1 \text{ avii) } y = (x+3 \tan(x))$$

$$\frac{dy}{dx} = 1 + 3 \sec^2(x)$$

Question No

$$\text{a) } y = (x + 3 \tan(x))$$

$$\frac{dy}{dx} = 1 + 3 \sec^2(x)$$

$$u = 3$$

$$v = \tan(x)$$

$$du = 0$$

$$dv = \sec^2(x)$$

$$3 \sec^2$$

$$\text{b) } y = \frac{1}{x} + \cos(3x) = x^{-1} + \cos(3x)$$

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

$$\frac{d^2 y}{dx^2} = 2x^{-3} - 9 \cos(3x)$$

$$\frac{d^3 y}{dx^3} = -6x^{-4} + 27 \sin(3x)$$

$$\frac{d^4 y}{dx^4} = 24x^{-5} + 81 \cos(3x) = \frac{24}{x^5} + 81 \cos(3x)$$

$$\text{c) } y = \frac{(2x+1)}{(3+x^2)}$$

$$\frac{du}{dx} = 2$$

$$u = 2x+1$$

$$v = 3+x^2$$

$$\frac{dy}{dx} = \frac{2(3+x^2) - 2x(2x+1)}{(3+x^2)^2} = \frac{v' du - u dv}{v^2}$$

$$\frac{dy}{dx} = \frac{6+2x^2-4x^2-2x}{9+3x^2+3x^2+x^4} = \frac{-2x^2-2x+6}{x^4+6x^2+9}$$

$$\text{when } x=0 \quad \frac{dy}{dx} = \frac{2}{3}$$

$$29i) 5x^2 + \frac{x^4}{4} + C$$

(3)

$$29ii) x^2 + 3e^x + C$$

(3)

$$29iii) 2\ln(x) + 4x + C$$

(3)

$$29iv) \int (x-1)(3x+4) dx \quad \text{expand 1st then } \int dx.$$

$$\left(\frac{x}{2} - x\right)\left(\frac{3}{2}x^2 + 4x\right) + C$$

$$29v) \int_3^6 (3x^2 - 2x) dx$$

$$y = \left[x^3 - x^2 \right]_3^6$$

$$(6^3 - 6^2) - (3^3 - 3^2) = 180 - 18 = 162$$

(3)

$$29vi) \int x \cdot \cos(x) dx$$

$$uv - \int v \cdot du$$

$$y = x \sin(x) - \int \sin(x) \cdot 1 dx$$

$$u = x \quad v = \sin x$$

$$dv = \cos x \quad du = 1$$

$$y = x \sin(x) + \cos(x)$$

(4)

$$29vii) \int_1^9 \ln x dx \quad \text{use PARTS AGAIN}$$

$$3ai) (3+2i)(1-i) = 3-3i+2i-2i^2 = 5-i \quad \text{or } i^2 = -1$$

$$3aii) \frac{3}{(2-i)} = \frac{3}{2-i} \times \frac{2+i}{2+i} = \frac{6+3i}{4-2i+2i-i^2}$$

$$\frac{6+3i}{4-i^2} = \frac{6+3i}{5}$$

$$3aiii) \frac{1}{i^5} = \frac{1}{i} = i^{-1} = \frac{1}{i} \cdot \frac{i}{i} = -i$$

3aii)

$$4ai) 4^{2x} = 3^{x+1}$$

$$\ln(4)^{2x} = \ln(3)^{x+1}$$

$$2x \ln(4) = (x+1) \ln(3)$$

$$2x \ln(4) = x \ln(3) + \ln(3)$$

$$2x \ln(4) = x \ln(3) \quad \times$$

$$\frac{2x \ln(4)}{x} = \ln(3)$$

$$x \ln(4) = \ln(3)$$

$$x = \frac{\ln(3)}{\ln(4)} \quad \times$$

$$x = 1.585$$

4aii) $2 \ln x = \ln(4x-4)$

4bi) $4 \log x + \log y + \log z$ ✓

4bii) $4 \ln x + \ln y - \ln z$ ✓

(2)

(2)