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Trinity Saint David

ACDB 4003

Complete, fold and seal
(see note 2 below)

SURNAME:

FITCHES

FORENAME(S):

JAMES AWOONG

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.
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	2217780
2	Title of Examination Paper	MATHEMATICS
3	Module Code	ACDB 4003
4	Date and Time of Examination	01/05/2024 09:00
5	Examination Venue	LLWYSD
6	Seat Number	11
7	Number of Answer Books handed in	1

List the numbers of the questions you have attempted	Office Use
1	10
2	8
3	10
4	3
5	2
7	13
8	7
Total	53

53%
good effort
James

① i $3x + 4y - 2z + 2x - 9y + 3z + 5x - 6y + 10z$
 $= 3x + 2x + 5x + 4y - 9y - 6y - 2z + 3z + 10z$
 $= 10x - 11y + 11z$

ii $x(x+5) - (x-4)$
 $= x^2 + 5x - x + 4$
 $= x^2 + 4x + 4$

iii $3qr \times 4pq^3 \times 5qr^2$
 $= 60pq^5r^3$

iv $\frac{12p^2q^3r}{6p^3q^3r^{-3}}$
 $= 2p^{-1}r^{-2} \cancel{q^0} = 1$

v $\frac{2fg}{16h} \times \frac{4gh^2}{48h} \times \frac{32fh^3}{64f^3}$
 $= \frac{512f^2g^2h^5}{4096f^3h^2}$
 $= \frac{1}{8}f^{-1}g^2h^3$

② i, $x^2 + 10x = -25$

$$\cancel{x^2 + 10x + 25 = 0}$$

$$x^2 + 10x + 25 = 0$$

$$x = \frac{-(-10) \pm \sqrt{(-10)^2 - 4(1)(25)}}{2(1)}$$

$$\frac{-10 \pm \sqrt{100 - 100}}{2}$$

$$x = \frac{-10}{2} = -5 \quad \underline{\underline{\text{write}}}$$

ii, $\frac{(x-3)}{4} = x + \frac{(2x-4)}{8}$

$$2(x-3) = 8x + 2x - 4$$

$$2x - 6 = 8x + 2x - 4$$

$$2x - 6 = 10x - 4$$

$$-6 + 4 = 10x - 2x$$

$$-2 = 8x$$

$$\Rightarrow -\frac{2}{8} = x$$

$$\frac{-2}{-2} = -4$$

$$\underline{\underline{-\frac{1}{4} = x}}$$



③ a i $4^{2x-1} = 3^{x+1}$

$$\log_{10} 4^{(2x-1)} = \log_{10} 3^{(x+1)}$$

$$(2x-1) \cancel{\times \log_{10} 4} = 2x \cancel{\log_{10} 3}$$

①

a ii $\log(x^2+4) - \log(x+8) = \log x$

$$\frac{\log(x^2+4)}{\log(x+8)} = \log x$$

$$\frac{x^2+4}{x+8} = x$$

$$x = \frac{4}{8} = \frac{1}{2}$$

⑤

b i $\log(x^2yz)$

$$= 2\log x + \log y + \log z$$

②

b ii $\log\left(\frac{x^4y^2}{z}\right)$

$$= 4\log x + 2\log y - \log z$$

②

(4)

$$A = \begin{bmatrix} i & j & k \\ 2 & -3 & 4 \\ 1 & 3 & -1 \end{bmatrix} \begin{bmatrix} + & - & + \\ - & + & - \\ + & - & + \end{bmatrix}$$

Answers here.

$$|A| = +i \begin{vmatrix} -3 & 4 \\ 3 & -1 \end{vmatrix} - j \begin{vmatrix} 2 & 4 \\ 1 & -1 \end{vmatrix} + k \begin{vmatrix} 2 & -3 \\ 1 & 3 \end{vmatrix}$$

Melker

Jy

$$= +i(3+12) - j(2+4) + k(6+3)$$

Cmm

Expressy

$$= +i(15) - j(6) + k(9)$$

(✓)

gib

(2)

d

(5)

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

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

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

$$+1(6) - 2(-1) + 3(5)$$

$$= 6 + 2 + 15$$

$$= 23$$

45

(2)

i) $y = 5x - 3$

$$\frac{dy}{dx} = 5(1) - 0 = 5$$

(2)

ii) $y = 4x + 10x^{\frac{1}{2}} + \frac{5}{6}$

$$\frac{dy}{dx} = 4(1) + 10(x^{-\frac{1}{2}}) + 0 = 4 + 5x^{-\frac{1}{2}} = 4 + \frac{5}{\sqrt{x}}$$

(1)

iii) $y = \frac{2}{x^5} + 9x^3$ $y = 2x^{-5} + 9x^3$

$$\frac{dy}{dx} = 2x^{-5} + 9(3x^2) = 2x^{-5} + 27x^2$$

(1)

iv) $y = \cos(20x)$

$$\frac{dy}{dx} = -20 \sin(20x)$$

(2)

v) $y = x^2 \cdot \sin(x)$ $u = x^2$ $v = \sin(x)$

$$\frac{du}{dx} = 2x$$
 $\frac{dv}{dx} = \cos(x)$

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

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

(2)

vi) $y = (8x+3)^5$ $u = (8x+3)$ $y = (u)^5$

~~$$\frac{dy}{dx} = (8(1) + 0)^5 = (8)^5$$~~

$$\frac{dy}{dx} = 5(8x+3)^4 \cdot 8$$

(1)

Question No

6

Examiner Only

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Arholwr yn unig

i) $y = 5x - 3$

$$\frac{dy}{dx} = 5(1) - 0 = 5$$

(2)

ii) $y = 4x + 10x^{\frac{1}{2}} + \frac{5}{6}$

$$\frac{dy}{dx} = 4(1) + 10(x^{-\frac{1}{2}}) + 0 = 4 + 5x^{-\frac{1}{2}} = 4 + \frac{5}{\sqrt{x}}$$

(1)

iii) $y = \frac{2}{x^5} + 9x^3$ $y = 2x^{-5} + 9x^3$

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(1)

iv) $y = \cos(20x)$

$$\frac{dy}{dx} = -20 \sin(20x)$$

(2)

v) $y = x^2 \cdot \sin(x)$

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

$$\frac{du}{dx} = 2x \quad \frac{dv}{dx} = \cos(x)$$

$$\begin{aligned} \frac{dy}{dx} &= x^2 \cdot 2x + \sin(x) \cdot 2x \\ &= 2x^3 + 2x \sin(x) \end{aligned}$$

(2)

vi) $y = (8x+3)^5$

$$u = (8x+3) \quad y = u^5$$

~~$$\frac{dy}{dx} = (8(1) + 0)^5 = (8)^5$$~~

$$\frac{dy}{dx} = 5(8x+3)^4 \cdot 8$$

(1)

iii $y = 2e^x + \ln(x)$

$$\frac{dy}{dx} = \cancel{0} \cdot 2e^x + \frac{1}{x} = 2e^x + \frac{1}{x}$$

①

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

$$u = (x+3) \quad v = (1+x^2)$$

$$\frac{du}{dx} = \frac{1}{1} \quad \frac{dv}{dx} = 2x$$

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

Cancelers have

$$= \frac{1+x^2 - 2x^2 - 6x}{(1+x^2)^2} = \frac{1+0-3}{(1+1)^2} = \frac{-2}{4}$$

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

x

③

$$\begin{aligned}
 \textcircled{8} \text{ i. } \int (4x + x^3) dx \\
 &= \frac{4x^2}{2} + \frac{x^4}{4} + C \\
 &= 2x^2 + \frac{x^4}{4} + C
 \end{aligned}$$

2

$$\begin{aligned}
 \text{ii. } \int (2x + 3e^x) dx \\
 &= \frac{2x^2}{2} + 3e^x + C \\
 &= x^2 + 3e^x + C
 \end{aligned}$$

2

$$\begin{aligned}
 \text{iii. } \int \left(\frac{1}{x} + 7\right) dx \\
 &= \ln x + 7x + C \\
 &= \ln x + C + 7x
 \end{aligned}$$

1

$$\begin{aligned}
 \text{iv. } \int (x^2 - 1)(3x + 4) dx \\
 &= (2x - 1)(3x + 4) \\
 &= 6x - 3x + 8x - 4 \\
 &= -5x - 4 \\
 &= -5 - 4 \\
 &= -9 + C
 \end{aligned}$$

James, this
is a good
effort,
well done!

$$\begin{aligned}
 \text{v. } \int_3^6 (3x^2 + 2x) dx \\
 &= \left[\frac{3x^3}{3} + \frac{2x^2}{2} \right]_3^6 = \left[x^3 + x^2 \right]_3^6 \\
 &= \{ (6)^3 + (6)^2 \} - \{ (3)^3 + (3)^2 \} \\
 &= 216 + 36 - 27 - 9 \\
 &= 252 - 36 \\
 &= 216
 \end{aligned}$$

2