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Trinity Saint David

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.

Complete, fold and seal
(see note 2 below)

SURNAME: Armin

FORENAME(S): Bailey

1	Student Number	ARM22874486
2	Title of Examination Paper	Mathematics GESG 1
3	Module Code	GOEN4001
4	Date and Time of Examination	20/01/25 09:30-11:30
5	Examination Venue	Hill house
6	Seat Number	A3

7	Number of Answer Books handed in	1
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List the numbers of the questions you have attempted	Office Use
Q2 a	22 ✓
b	6 ✓
c	4 ✓
d	0 ✓
Q2 a	10 ✓
b	3 ✓
c	6 ✓
d	2 ✓
e	7 ✓
Q3 a	13 ✓
b	6 ✓
c	4 ✓
d	4 ✓
Total	87/100 ✓

87%

RK

(Gweler yr ochr arall am y fersiwn Cymraeg)

a)

$$i) \frac{dy}{dx} = 12x^3 + 15x^2 + 8x + 7$$

2

$$ii) y = x^{-3} + x^{-\frac{2}{5}} - 2\sqrt{x}$$

$$\frac{dy}{dx} = -3x^{-4} - \frac{2}{5}x^{-\frac{7}{5}} - 2\sqrt{x}$$

3

$$iii) \frac{dy}{dx} = 4\cos(2x) - 9\sin(3x) + 1\sec^2(5x)$$

3

$$iv) \text{ Let } u = 7x^3 \quad \& \quad V = \sin(5x)$$

$$\frac{du}{dx} = 21x^2$$

$$\frac{dV}{dx} = 5\cos(5x)$$

$$\frac{dy}{dx} = 7x^3(5\cos(5x)) + \sin(5x)(21x^2)$$

4

$$= 35x^3\cos(5x) + 21x^2\sin(5x)$$

$$v) \text{ Let } u = 2\sin(5x) \quad \& \quad v = 3e^{5x}$$

$$\frac{du}{dx} = 10\cos(5x)$$

$$\frac{dv}{dx} = 15e^{5x}$$

$$\frac{dy}{dx} = \frac{3e^{5x}(10\cos(5x) - 2\sin(5x)(15e^{5x}))}{(3e^{5x})^2}$$

$$= \frac{3e^{5x}(10\cos(5x) - 2\sin(5x)(15e^{5x}))}{3e^{10x}}$$

4

$$vi) \frac{dy}{dx} = 15(2x^3 + 4)^2 \times (6x^2)$$

3

$$= 90x^2(2x^3 + 4)^2$$

$$vii) y = (x^4 + 5)^{\frac{2}{3}}$$

$$\frac{dy}{dx} = \frac{2}{3}(x^4 + 5)^{-\frac{1}{3}}(4x^3)$$

3

$$= \frac{8}{3}x^3(x^4 + 5)^{-\frac{1}{3}}$$

Q13/4/35Q1a22/22

$$b) \frac{\partial W}{\partial x} = 25x^4 + 8xy^4 + \cos x$$

$$\frac{\partial^2 W}{\partial x^2} = 100x^3 + 8y^4 - \sin x$$

$$\frac{\partial^2 W}{\partial y \partial x} = 32xy^3$$

$$\frac{\partial W}{\partial y} = 16x^2y^3 + 9y^2$$

$$\frac{\partial^2 W}{\partial y^2} = 48x^2y^2 + 18y$$

$$\frac{\partial^2 W}{\partial x \partial y} = 32xy^3$$

Q1b

6/6

6

$$c) y = \cos(2x) + x^2$$

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

$$\frac{d^2y}{dx^2} = -4\cos(2x) + 2$$

$$-4\cos(2x) + 2 - 4(-2\sin(2x) + 2x) + 4(\cos(2x) + x^2)$$

$$-4\cos(2x) + 2 + 8\sin(2x) - 8x + 4\cos(2x) + 4x^2$$

$$4x^2 - 8x + 8\sin(2x) + 2 = \text{RHS}$$

$$\text{LHS} = \text{RHS} \quad \checkmark$$

Q1c

4/4

$$d) \frac{dy}{dx} =$$

$$\frac{dy}{dx}$$

$$u = x \quad v = e^{2x}$$

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

$$\frac{d^2u}{dx^2} = 0 \quad \frac{d^2v}{dx^2} = 4e^{2x}$$

$$\frac{d^3u}{dx^3} = 0 \quad \frac{d^3v}{dx^3} = 8e^{2x}$$

Q1d

0/3

Question 2

$$a) \frac{3x-4}{(x+2)(x-5)} = \frac{A}{(x+2)} + \frac{B}{(x-5)}$$

$$\frac{3x-4(x+2)(x-5)}{(x+2)(x-5)} = \frac{A(x+2)(x-5)}{(x+2)} + \frac{B(x+2)(x-5)}{(x-5)}$$

$$3x-4 = A(x-5) + B(x+2)$$

$$\text{Let } x = 5$$

$$3(5)-4 = A(5-5) + B(5+2)$$

$$11 = B(7)$$

$$B = \frac{11}{7}$$

$$B = 1.57$$

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

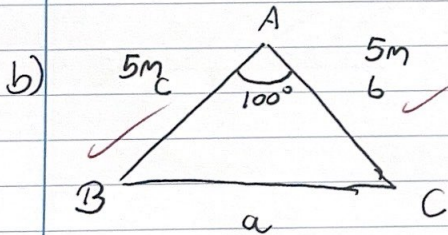
$$3(-2)-4 = A(-2-5) + B(-2+2)$$

$$-10 = A(-7)$$

$$A = \frac{-10}{-7}$$

$$A = 1.43$$

$$\frac{3x-4}{(x+2)(x-5)} = \frac{1.43}{(x+2)} + \frac{1.57}{(x-5)}$$



show working

$$a = \sqrt{5^2 + 5^2 - 2(5)(5) \times \cos(100)}$$

$$a = 7.66m$$

Q2
28/33

Q2a

10/10

Q2b

3/4

$$c) \quad x^2 - 6x + 8 \quad \begin{array}{cc} 8 & \\ -2 & -4 \\ \hline +2 & -4 \end{array}$$

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

$$x^2 - 4x \quad \text{B} \quad (x-2)(x-4) \quad \checkmark$$

$$(\tan x - 2)(\tan x - 4) = 0 \quad \underline{6}$$

$$\tan x - 2 = 0 \quad \checkmark$$

$$\tan x - 4 = 0 \quad \checkmark$$

$$\tan^{-1} 2 = \underline{63.43^\circ} \quad \tan^{-1} 4 = \underline{75.96^\circ}$$

$$180 + 63.43 = \underline{243.43^\circ} \quad \checkmark$$

$$180 + 75.96 = \underline{255.96^\circ} \quad \checkmark$$

$$d) \quad y = x^2 \quad \& \quad y = x + 20$$

$$x^2 = x + 20 \quad \Rightarrow \quad x^2 - x - 20 = 0 \quad \checkmark$$

$$\frac{-1 \pm \sqrt{1^2 - 4(1)(-20)}}{2(1)} \quad \Rightarrow \quad \frac{-1 \pm \sqrt{1+80}}{2} \quad \frac{-1 \pm 9}{2}$$

$$x = \overset{-4}{4}$$

$$x = \overset{5}{-5}$$

e)

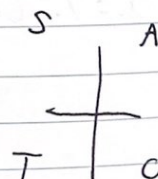
$$i) \quad \sin^{-1}(0.6) = \underline{36.87^\circ} \quad \checkmark \quad 180 - 36.87 = \underline{143.13^\circ} \quad \checkmark$$

$$ii) \quad \cos^{-1}\left(\frac{6}{7}\right) = \underline{31^\circ} \quad \checkmark \quad 360 - 31 = \underline{329^\circ} \quad \checkmark$$

$$iii) \quad \tan^{-1}\left(\frac{3}{-3}\right) = \pi 33.69 \quad \checkmark \quad 180 - 33.69 = \underline{146.31^\circ} \quad \checkmark$$

ignore $\uparrow$
NOT ANSWER

$$360 - 33.69 = \underline{326.31^\circ} \quad \checkmark$$



Q2

6/6

Q2d

2/6

Q2e

7/7

Question 3.

a)

$$i) \ln(x^2 + 2x) = \ln((3)(x+1))$$

$$\checkmark \quad \checkmark$$

$$x^2 + 2x = (3)(x+1) \Rightarrow x^2 + 2x = 3x + 3$$

$$\begin{matrix} x^2 & - & x & - & 3 & = & 0 \\ a & & b & & c \end{matrix}$$

4

$$\frac{-(-1) \pm \sqrt{(-1)^2 - 4(1)(-3)}}{2(1)} \Rightarrow \frac{1 \pm \sqrt{1+12}}{2} \Rightarrow \frac{1 \pm \sqrt{13}}{2}$$

$$x = 2.3 \checkmark \quad x = -1.3 \times$$

$$ii) \log((x+3)(2x+1)) = 2\log(3x-1)$$

log

log

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

x 0

$$2x^2 + x + 6x + 3 = 6x - 2 \Rightarrow 2x^2 - 5x$$

$$-2x^2 - 1x - 5$$

$$\begin{matrix} 2x^2 & + & x & + & 5 \\ a & & b & & c \end{matrix}$$

$$\frac{-1 \pm \sqrt{1^2 - 4(2)(5)}}{2(2)}$$

✱

$$\log(3x-1) \times \log(3x-1)$$

Q327/32Q3a13/18

$$\text{iii) } \log(5^{(x+2)} \times 2^{(2-x)}) = 3^{(x+3)}$$

$$\log 5^{(x+2)} + \log 2^{(2-x)} = \log 3^{(x+3)}$$

$$(x+2) \log 5 + (2-x) \log 2 = (x+3) \log 3$$

$$(x+2) 0.7 + (2-x) 0.3 = (x+3) 0.48$$

$$0.7x + 1.4 + 0.6 - 0.3x = 1.44 + 0.48x$$

$$0.4x + 2 = 1.44 + 0.48x$$

$$-0.08x = -0.56$$

$$x = \frac{-0.08}{-0.56} \Rightarrow x = 0.14$$

$$\text{iv) } 4(5x+2) = 3(2x-3)$$

$$20x + 8 = 6x - 9$$

$$14x + 8 = -9$$

$$14x = -17$$

$$x = \frac{-17}{14}$$

$$x = -1.22$$

$$v) 8\left(\frac{3x-2}{4}\right) + \frac{(x+5)}{2} = \frac{7}{3}$$

$$2(3x-2) + 4(x+5) = \frac{56}{3} \quad \checkmark$$

$$6x-4 + 4x+20 = \frac{56}{3} \quad 18.67$$

$$10x + 16 = 18.67 \quad \checkmark$$

$$10x = 2.67 \quad \checkmark$$

$$x = \frac{2.67}{10} \quad x = 0.267 \quad \checkmark$$

6)

i)

$$\begin{array}{r} 35 \\ -5-7 \\ \hline \end{array} \} -12$$

$$(z-5)(z-7) \quad \checkmark$$

$$z^2 - 7z - 5z + 35$$

ii)

$$\sqrt{121} = 11$$

$$(m+11)(m-11) \quad \checkmark$$

iii)

$$k(1+2m) + 5n(1+2m) \quad \checkmark$$

$$(1k + 5n)(1+2m) \quad \checkmark$$

Q3b6/6

Q)
i)

$$\begin{array}{r} 4 \\ 14 \\ \hline 22 \end{array}$$

$$\begin{array}{r} 6 \\ 16 \\ \hline 23 \end{array}$$

~~$$(2p+1)(2p+6)$$~~
~~$$4p^2 + 12p$$~~

Q3C4/14

~~$$(2p)(2p)$$~~

~~$$(4p+2)(p+3)$$~~

~~$$4p^2 + 8p + 2p + 6$$~~

$$(p+2)(4p+3)$$

$$4p^2 + 3p + 8p + 6$$

*

$$(p+2)=0$$

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

$$p = -2$$

$$p = -\frac{3}{4}$$

$$p = -0.75$$

ii)

$$\begin{array}{r} 63 \\ 163 \\ \hline 321 \\ 79 \end{array}$$

$$(S+7)(S+9)=0$$

$$(S+7)=0 \quad (S+9)=0$$

$$S = -7$$

$$S = -9$$

Q3d4/14

d)

$$3x^2 + 4x - 10 = 0$$

a b c

$$\frac{-4 \pm \sqrt{4^2 - 4(3)(-10)}}{2(3)} \Rightarrow \frac{-4 \pm \sqrt{16 + 120}}{6} \Rightarrow \frac{-4 \pm \sqrt{136}}{6}$$

$$x = 1.28 \quad x = -2.6$$