



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:

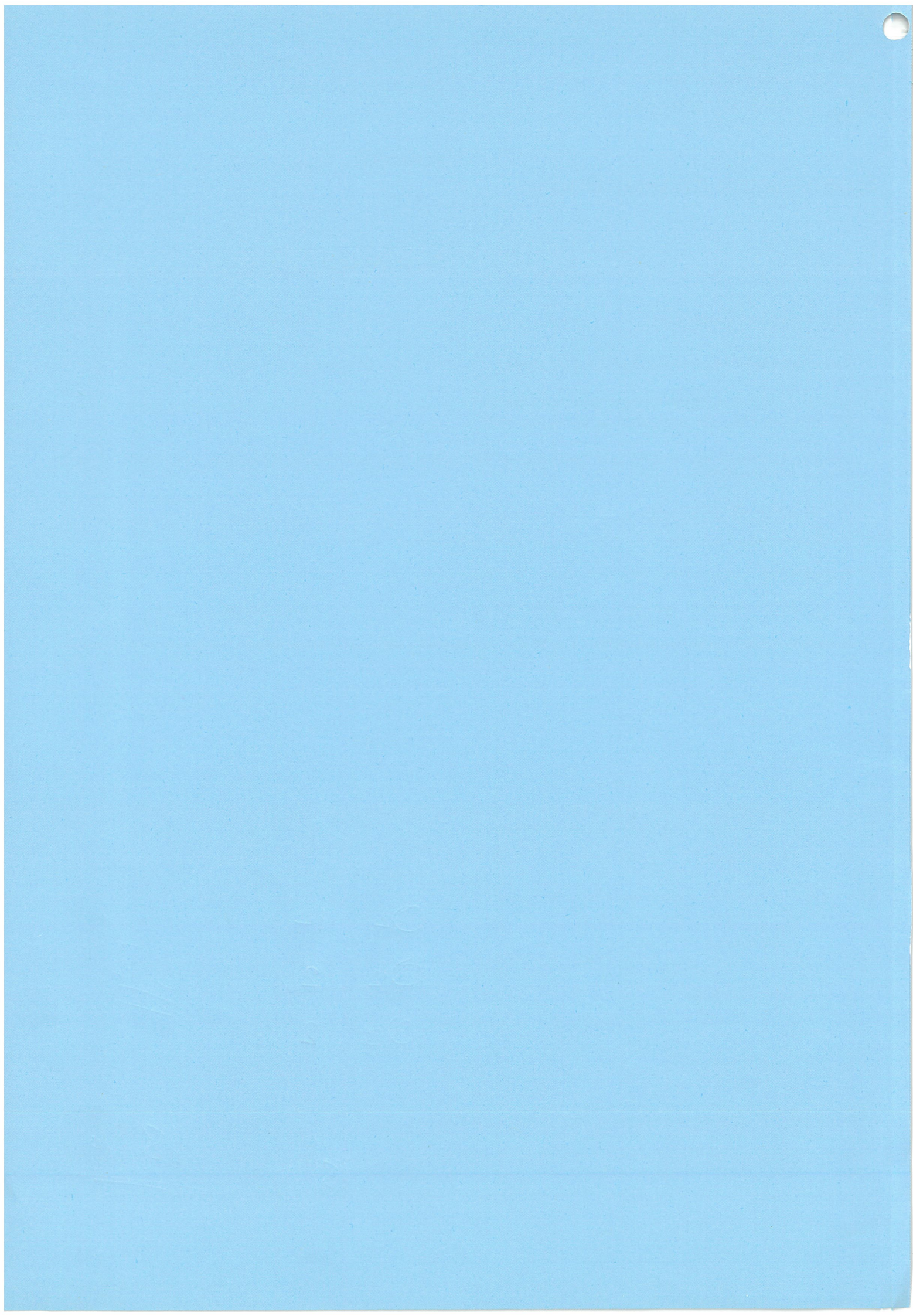
Barrett

FORENAME(S):

Joshua

1	Student Number	BAR21864313
2	Title of Examination Paper	Mathematics Test 1
3	Module Code	GOEN4001
4	Date and Time of Examination	14:00 19/01/2026
5	Examination Venue	Ty Coch College
6	Seat Number	A2
7	Number of Answer Books handed in	1

List the numbers of the questions you have attempted	Office Use
1	
2	
3	
Q1	14 ✓
Q2	2 ✓
Q3	2 ✓
Total	18/100 ✓



Question 1

Question No.

Examiner Only

1) a) Find the first derivative of the following functions

Q1

i) $y = 2x^6 - 5x^3 + 4x - 9$

14/22

$$\frac{dy}{dx} = 12x^5 - 15x^2 + 4 - 0$$

Q1a

ii) $y = \frac{4}{x^{\frac{1}{2}}} - 5\sqrt{x} + \frac{3}{e^2}$

13/22

$$\frac{dy}{dx} = -2x^{-\frac{3}{2}} - \frac{5}{2\sqrt{x}} + 0$$

iii) $y = 4\sin(4x) - 2\cos(5x) + 3\tan\left(\frac{x}{3}\right)$

$$\frac{dy}{dx} = 16\cos(4x) - 10\sin(5x) + 1\tan\sec^2\left(\frac{x}{3}\right)$$

iv) $y = 5x^4 e^{2x}$

Product rule: $\frac{dy}{dx} = u\left(\frac{dv}{dx}\right) + v\left(\frac{du}{dx}\right)$

$$u = 5x^4$$

$$v = e^{2x}$$

$$\frac{du}{dx} = 20x^3$$

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

$$\frac{dy}{dx} = 5x^4(2e^{2x}) + e^{2x}(20x^3)$$

$$v) y = \frac{3\cos(3x)}{e^x + 5}$$

Quotient rule :

$$\frac{dy}{dx} = \frac{v \left(\frac{du}{dx} \right) - u \left(\frac{dv}{dx} \right)}{v^2}$$

$$u = 3\cos(3x)$$

$$\frac{du}{dx} = -9\sin(3x)$$

$$v = e^x + 5$$

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

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

$$vi) y = \frac{2}{7} (3x^4 + 4x)^{\frac{3}{2}}$$

$$\frac{2}{7} (3) (3x^4 + 4x)^{\frac{1}{2}} \quad (??)$$

$$\frac{dy}{dx} = \frac{6}{7}$$

$$y = \frac{2}{7}^3$$

$$\frac{du}{dx} = 12x^3 + 4$$

$$u = 3x^4 + 4x$$

Chain rule :

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

$$\frac{6}{7} (12x^3 + 4)^2$$

vii) $y = \frac{1}{5} \sqrt[5]{(5x^4 + \sin(2x))}$

?? 0

b

b) $w = 3x^4 y^3 + 5x^3 + 6y^2 + e^{2x} - \cos(3y)$
(Partial differentiation.)

Q1b

0/6

? 0

c) if $y = 3e^x + x^2$ show that:

$$\frac{d^2y}{dx^2} - 3 \frac{dy}{dx} + 2y = 2x^2 - 6x + 7$$

Q1c

1/4

$$\frac{dy}{dx} = 3xe^x + 2x \checkmark$$

1

$$\frac{d^2y}{dx^2} = 3x^2e^x + 2 \checkmark$$

$$3x^2e^x + 2 - 3(3xe^x + 2x) + 2(3e^x + x^2)$$

Q1d

d) $x \sin(x)$

0/3

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

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

Question 2:

a) express, $\frac{5x+7}{(x+1)(x-3)}$

Q22/33

Linear factors:

$$\frac{g(x)}{(x+a)(x+b)} = \frac{A}{(x+a)} + \frac{B}{(x+b)}$$

Q2a

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

0/9

IF $x = 1$

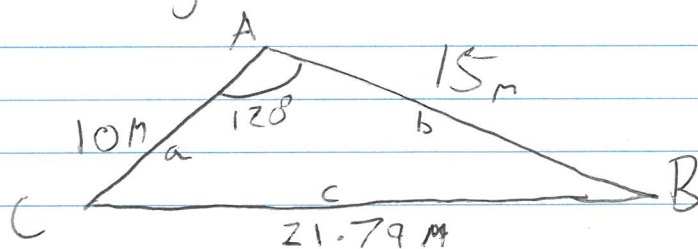
$$\frac{5+7}{(1+1)(1-3)} = \frac{\cancel{5}}{(1+1)} + \frac{7}{(1-3)} = -1$$

IF $x = -3$ $\frac{-15}{(-3+1)} + \frac{7}{(-3-3)} = 6.33$

b) An engineer is designing a triangular truss ABC. The sides are AB = 15M and AC = 10M and the angle at vertex A is 120° determine:

Q2b2/5

- The length of BC (21.79M)
- The angles at vertices B and C



Cosine Rule:

$$BC = a^2 + b^2 - 2ab \cos(A)$$

$$= 10^2 + 15^2 - 2(10 \times 15) \cos(120) = 475$$

$$= \sqrt{475} = 21.79$$

c) Factorise : $x^2 - 11x + 24$, Solve for $0 \leq x \leq 360^\circ$

$$(x - 3)(x + 8)$$

1	210
2	49
3	8

$$\tan^2 x - 11 \tan x + 24 = 0$$

$$\text{IF } x = -3 \times \underline{0}$$

~~$$\tan^{-1}(\tan(2 \times 3)) = 11 \tan^{-1} 3 + 24 =$$~~

Q20

0/6

d)

Q26

0/6

e) i) $2 \sin x = 0.75$

BS	a
ST	c

$$2 \sin^{-1}(0.75) = 97.18^\circ$$

$$\text{So } 180 - 97.18 = 82.82^\circ$$

ii) ~~$4 \cos x + 1 = 0$~~

0/7

Q20

0/7

iii) $5 \tan x = 1$

$$-5 \tan^{-1}(1) = -225^\circ$$

or $225^\circ - 180^\circ$

~~45°~~ $+ 2$

S	A
T	C

Question 3:

13) factorise completely:

i) $(p-6)(p-7)$ $\leftarrow$ 1 12
2 11
3 10
4 9
5 8
6 7

ii) $4b^2 - 49$

$(4b-7)(b-7)$ $\times 0$

iii) $mn + 5mp + 3nq + 15pq$

$(m+5p)(n+3q)$ $\times 0$

d) Solve quadratic equation by using the quadratic formula

$$3w^2 - 2w - 8 = 0$$

$$ax^2 + bx + c = 0 \text{ then } x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$a = 3w^2$ $b = -2w$ $c = -8$

$$\frac{2w \pm \sqrt{4w^2 + 4(3w^2 \times -8)}}{3w^2(2)}$$

$3w^2(2)$

Q3

2/32

Q3a

0/18

Q3b

2/6

Q3c

0/4

Q3d

0/4

$$\text{Add: } \frac{2w \pm \sqrt{\cancel{4} - 4(3w^2 \times 8)}}{3w^2(2)}$$

x

