



Gower College Swansea  
Coleg Gŵyr Abertawe

## Examination Answer Book

12 Pages

### Instructions to candidates

1. Please give the information requested in the boxes below and enter your name in the space provided at the top right of the page.
2. Wet the gum at the top right hand corner of the page, fold over and seal down in order to conceal 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.

Surname Osmond  
First name(s) Matthew James  
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|   |                                                   |                                      |
|---|---------------------------------------------------|--------------------------------------|
| 1 | Student Number                                    | OSM14816218                          |
| 2 | Title of Examination Paper                        | Mathematics Test ONE                 |
| 3 | Reference Number of Examination/<br>Module Number | M4X00349.                            |
| 4 | Date and Time of Examination                      | 14:00<br>18/01/24                    |
| 5 | Examination Venue                                 | Tychoch Gower College<br>Sports hall |
| 6 | Seat Number                                       | 4C                                   |
| 7 | Number of Answer Books handed in                  | 1                                    |

| List the numbers of<br>the questions you<br>have attempted | Office<br>Use |
|------------------------------------------------------------|---------------|
| Q1                                                         |               |
| a                                                          | 21            |
| b                                                          | 5             |
| c                                                          | 4             |
| d                                                          | 2             |
| e                                                          | 1             |
| Q2                                                         |               |
| a                                                          | 7             |
| b                                                          | 6             |
| c                                                          | 7             |
| d                                                          | 1             |
| e                                                          | 0             |
|                                                            |               |
|                                                            |               |
|                                                            | 54/80         |

Q1  
a

Q1 a  
21

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

$\frac{dy}{dx} = 16x^3 + 15x^2 + 4x - 3$  ✓

(2)

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

$\frac{dy}{dx} = 15(2x+4)^{\frac{1}{2}} \times (2)$  ✓

(2)

iii)  $y = \sqrt{x} + \ln x$

$\frac{dy}{dx} = x^{\frac{1}{2}} + \frac{1}{x}$  ✓

$\frac{dy}{dx} = ?$

(1)

$\frac{dy}{dx} = \left( x^{\frac{1}{2}} + \frac{1}{x} \right)$  ✓

iv)  $y = \sin 5x + 6\cos 2x + 3\tan 3x$

$\frac{dy}{dx} = 5\cos 5x - 12\sin 2x + 9\sec^2 3x$  ✓

(3)

v)  $y = x^3 \cos x$

(4)

$\frac{dy}{dx} = x^3 \cos x$

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

$\cos x = -\sin x$

vi)  $y = \frac{2x^2 + 3x}{e^{5x}}$

(5)

$u = 2x^2 + 3x$  ✓  
 $v = e^{5x} = 5e^{5x}$

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

$$\text{vii)} \quad y = e^{2x} \sin 2x$$

(4)

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

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

$$\sin 2x = 2 \cos 2x$$

b)

$$z = 3x^6 + 5x^2y^4 + 2y^3$$

x

y

$$\frac{\partial z}{\partial x} = 18x^5 + 10xy^4$$

$$1 \quad 20x^2y^3 + 6y^2 = \frac{\partial z}{\partial y}$$

$$\frac{\partial^2 z}{\partial x^2} = 90x^4 + 10y^4$$

$$2 \quad 60x^2y^2 + 12y = \frac{\partial^2 z}{\partial y^2}$$

$$\frac{\partial^2 z}{\partial y \partial x} = 40xy^3$$

$$\frac{\partial y}{\partial x} = 40xy^3 = \frac{\partial^2 z}{\partial x \partial y}$$

c)

$$y = 4x^3 + 5x + 6$$

$$2 \frac{d^2y}{dx^2} + 3 \frac{dy}{dx} - 4x - 8$$

$$\frac{dy}{dx} = 12x^2 + 5$$

$$2(24x) + 3(12x^2 + 5) - 4x - 8$$

$$\frac{d^2y}{dx^2} = 24x$$

$$48x + 36x^2 + 15 - 4x - 8$$

$$36x^2 + 48x - 4x + 15 - 8$$

$$36x^2 + 44x + 7$$

d)  $y = 3\cos 2x$

Q. d

1  $-6\sin 2x$  ✓

2  $-12\cos 2x$  ✓

3  $24\sin 2x$  ✓

4  $48\cos 2x$  ✓

2

e)  $y = x^2 - 6x + 5$   $y = x^2 - 6x + 5 = x - 3$   
 $y = x - 3$  ✓

Q. e



$1 \times 2$   $2 \times 1$

$1 \times 8$   $8 \times 1$

$2 \times 4$   $4 \times 2$

1

$y = x^2 - 7x + 8 \geq 0$

$(x + 1)(x + 8)$  ✗

$x = 1$   $x = -8$

$1(x) - 3$   $-8(x) - 3$  ✗

$y = +2$

$y = -11$

Q2

a)

$$i) \ln(3x-5) + \ln(3x+4) = 2\ln(3x-4)$$

$$\ln(3x-5)(3x+4) = \ln(3x-4)(3x-4) \quad (2)$$

$$9x^2 + 12x - 15x - 20 = 9x^2 - 12x - 12x + 16$$

$$9x^2 +$$

$$9x^2 - 3x + 20 = 9x^2 - 24x + 16$$

$$27x = 36 \quad \checkmark$$

$$x = \frac{36}{27}$$

$$x = 1.33$$

$$ii) 3^{2+x} \times 2^{3-x} = 5^x$$

$$\ln 3(2x+x) \times \ln 2(3-x) = \ln 5(x) \quad \checkmark$$

$$1.09(2x+x) \times 0.69(3-x) = 1.60(x) \quad (1)$$

$$2.18x + 1.09x \times 2.07 - 0.69x = 1.60x$$

$$3.27x \times 2.07 - 0.69x = 1.60x$$

$$3.27x - 0.69x + 2.07 = 1.60x$$

$$2.58x + 2.07 = 1.60x$$

$$2.07 = 1.60x - 2.58x$$

$$2.07 = 0.98x$$

$$2.11 = x$$

$$iv) \frac{x(x+2)}{6} + \frac{(7x+1)}{9} = \frac{x}{18} \quad \times 18$$

$$3(x+2) + 2(7x+1) = 1(x) \quad (4)$$

$$3x+6+14x+2 = x$$

$$17x+8 = x$$

$$8 = x - 17x$$

$$8 = -16x$$

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

$$x = 0.5$$

b)

$$i) t^2 +$$

$$(t +$$

$$44$$

$$ii) 5q^2 +$$

$$(5q +$$

$$iii) N^2$$

$$(N$$

$$iv) m^2 -$$

$$c) f$$

$$i) 6x^2$$

$$(3x$$

$$(3$$

$$3x$$

$$ii) x^2$$

$$x^2$$

$$(x$$

$$x$$

b)

$$i) \quad t^2 + 8t + 15$$

$$(t + 5)(t + 3)$$

$$\begin{array}{cc} 1 \times 15 & 15 \times 1 \\ 3 \times 5 & 5 \times 3 \end{array}$$

Q2b

~~$$t^2 + 8t + 15 = 0$$~~

$$t = -3$$

6/11

$$ii) \quad 5q^2 + 17q + 6$$

$$6 \times 1 \quad 6 \times 1$$

$$3 \times 2 \quad 2 \times 3$$

$$(5q + 2)(q + 3)$$

$$iii) \quad N^2 - 121$$

$$\sqrt{121} = 11$$

$$(N - 11)(N + 11)$$

$$iv) \quad m^2 - 4mn + 3m - 12n$$

x

09

c)

$$i) \quad 6x^2 + 19x + 15 = 0$$

$$1 \times 15 \quad 15 \times 1$$

$$(3x + 5)(2x + 3) = 0$$

$$5 \times 3 \quad 3 \times 5$$

$$(3x + 5)(2x + 3) = 0$$

$$3x = -5 \quad 2x = -3$$

$$x = \frac{-5}{3} \quad x = \frac{-3}{2}$$

$$x = -2.5$$

Q2c

7/11

$$ii) \quad x^2 = -2x + 24$$

(2)

$$1 \times 24 \quad 24 \times 1$$

$$x^2 + 2x - 24 = 0$$

$$2 \times 12 \quad 12 \times 2$$

$$(x + 4)(x + 6) = 0$$

$$4 \times 6 \quad 6 \times 4$$

$$x = 4$$

$$x = -6$$

$$3 \times 8 \quad 8 \times 3$$

iii)

$$2x^2 - 21 = 11x$$

$$2x^2 + 3x - 14x$$

$$2x^2 - 11x - 21 = 0$$

$$21 \times 1 \quad 1 \times 21$$

$$7 \times 3 \quad 3 \times 7$$

$$(2x + 3)(x - 7)$$

$$(x - 7)(2x + 3)$$

$$x = 7$$

$$2x = -3$$

(3)

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

d)

$$6x^2 - 13x - 8 = 0$$

$$a \quad b \quad c$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

(1)

$$x = \frac{-13 \pm \sqrt{13^2 - 4(6)(-8)}}{2(6)}$$

$$x = \frac{-13 \pm \sqrt{169 + 192}}{12}$$

$$x = \frac{-13 \pm \sqrt{361}}{12}$$

$$x = 1.48$$

$$x = -0.68$$

$$e = T = 2\pi \sqrt{\frac{L}{mg}}$$

$$2\pi \sqrt{L} = mg$$

$$\frac{2\pi \sqrt{L}}{g} = m$$