



Gower College Swansea
Coleg Gŵyr Abertawe

Examination Answer Book

12 Pages

Instructions to candidates

- Please give the information requested in the boxes below and enter your name in the space provided at the top right of the page.
- Wet the gum at the top right hand corner of the page, fold over and seal down in order to conceal your name..
- 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.
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Name William Williams
First name(s) Steven
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1	Student Number	WIL18844193
2	Title of Examination Paper	Mathematics (Test 4)
3	Reference Number of Examination/ Module Number	M4X00391
4	Date and Time of Examination	18/01/2021 2 pm
5	Examination Venue	Sports Hall
6	Seat Number	D2

7	Number of Answer Books handed in	
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List the numbers of the questions you have attempted	Office Use
Q1	
a	21
b	6
c	4
d	2
e	9
Q2	
a	15
b	9
c	8
d	4
e	3
	74/80

Question One

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

$$\frac{dy}{dx} = 36x^3 + 15x^2 + 4x - 3 \quad \checkmark \quad (2)$$

ii) $y = 5(2x+4)^3$

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

$$= 30(2x+4)^2 \quad \checkmark \quad (2)$$

iii) $y = x^{\frac{1}{2}} + \ln x$

$$\frac{dy}{dx} = \frac{1}{2} x^{-\frac{1}{2}} + \frac{1}{x} \quad \checkmark$$

$$= \frac{1}{2\sqrt{x}} + \frac{1}{x} \quad \checkmark \quad (2)$$

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

$$\frac{dy}{dx} = 5 \cos 5x + (-2)6 \sin 2x + 9 \sec^2 3x \quad \checkmark \quad (3)$$

$$= 5 \cos 5x - 12 \sin 2x + 9 \sec^2 3x \quad \checkmark$$

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

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

$$= 3x^2 \cos x - x^3 \sin x \quad \checkmark \quad (3)$$

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

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

$\frac{du}{dx} = 4x + 3$, $\frac{dv}{dx} = 5e^{5x}$

(5)

$\frac{dy}{dx} = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2}$

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

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

~~$= 4xe^{5x} + 3e^{5x} - 10x^2e^{5x} - 15xe^{5x}$~~

~~$= \frac{3e^{5x} - 10x^2e^{5x} - 11xe^{5x}}{e^{10x}}$~~

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

(4)

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

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

Q.16

$$\frac{\partial z}{\partial x} = 18x^5 + 10xy^4 \quad \textcircled{1} \quad \frac{\partial z}{\partial y} = 20x^2y^3 + 6y^2 \quad \checkmark$$

6

$$\frac{\partial^2 z}{\partial x^2} = 90x^4 + 10y^4 \quad \checkmark \quad \frac{\partial^2 z}{\partial y^2} = 60x^2y^2 + 12y \quad \checkmark$$

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

$$i) \frac{\partial^2 z}{\partial x^2} = 90x^4 + 10y^4 \quad \checkmark \quad \textcircled{1}$$

$$ii) \frac{\partial^2 z}{\partial y^2} = 60x^2y^2 + 12y \quad \textcircled{1}$$

$$iii) \frac{\partial^2 z}{\partial x \partial y} = 40xy^3 \quad \textcircled{1}$$

$$iv) \frac{\partial^2 z}{\partial y \partial x} = 40xy^3 \quad \textcircled{1}$$

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

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

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

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

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

$$36x^2 + 44x + 7 \quad \checkmark$$

$$d) y = 3 \cos 2x$$

$$\frac{dy}{dx} = -6 \sin 2x \quad \checkmark$$

$$\frac{d^2y}{dx^2} = -12 \cos 2x \quad \checkmark$$

$$\frac{d^3y}{dx^3} = 24 \sin 2x \quad \checkmark$$

$$\frac{d^4y}{dx^4} = 48 \cos 2x \quad \checkmark$$

Q1 c

4

Q1 d

2

$$e) x - 3$$

$$x^2 -$$

$$(x - 8)$$

$$x - 8$$

$$x =$$

$$y =$$

$$y \text{ at}$$

e) $x - 3 = x^2 - 6x + 5$ ✓

$x^2 - 7x + 8 = 0$ ✓ (2)

$(x - 8)(x + 1) = 0$ ✗

$x - 8 = 0$ or $x + 1 = 0$

$x = 8$ ✗ or $x = -1$ ✗

$y = x - 3$

ya

at $x = 8$

$y = 8 - 3$

$y = 5$ ✗

$(8, 5)$

at $x = -1$

$y = 8 - (-1)$

$y = 9$

$(-1, 9)$ ✗

Question Two

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

$$9x^2 + 12x - 15x - 20 = 9x^2 - 24x + 16$$

$$21x = 36$$

$$x = \frac{36}{21}$$

$$21$$

$$x = 1.71$$

(5)

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

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

(4)

$$2\ln 3 + x\ln 3 + 3\ln 2 + x\ln 2 = x\ln 5$$

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

$$x(\ln 3 - \ln 2 - \ln 5) = -2\ln 3 - 3\ln 2$$

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

$$\ln 3 - \ln 2 - \ln 5$$

$$x = 3.55$$

iii) $4(x+2) = 6(2x+5)$

(2)

$$4x + 8 = 12x + 30$$

$$-8x = 22$$

$$x = -\frac{11}{4}$$

$$x = -\frac{11}{4}$$

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

$$3(x+2) + 2(7x+1) = x$$

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

$$16x = -8$$

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

$$2$$

(4)

Q2 a

15

$$b) i) t^2 + 8t + 15$$

$$(t+3)(t+5) \quad (2)$$

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

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

$$iii) N^2 - 121$$

$$(N+11)(N-11) \quad (2)$$

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

$$m(m+3) - 4n(m+3) \quad (3)$$

$$(m-4n)(m+3)$$

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

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

$$2x+3=0 \quad \text{or} \quad 3x+5=0$$

$$2x = -3$$

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

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

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

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

$$x+4=0$$

$$x = -4$$

$$\text{or} \quad x-6=0$$

$$x = 6$$

$$iii) 2x^2 - 11x + 15$$

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

$$2x+3=0$$

$$2x = -3$$

$$d) x = -b$$

$$= -\frac{b}{a}$$

$$x =$$

$$x =$$

$$x$$

$$e) T =$$

$$\frac{T}{2\pi}$$

$$\frac{T^2}{4\pi^2}$$

$$m$$

$$\text{iii)} \quad 2x^2 - 11x - 21 = 0$$

$$(2x+3)(x-7) = 0 \quad \checkmark$$

$$2x+3=0 \quad \text{or} \quad x-7=0 \quad \checkmark$$

$$2x = -3 \quad x = 7$$

$$\frac{-3}{2} \quad \checkmark \quad \checkmark \quad (3)$$

$$\text{d)} \quad x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \quad \checkmark$$

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

$$x = \frac{13 \pm \sqrt{25}}{12} = 13 \pm 5$$

$$x = \frac{13 \pm 19}{12} \quad \checkmark$$

$$x = 2.67 \quad \checkmark \quad \text{or} \quad x = -\frac{1}{2} \quad \checkmark$$

$$\text{e)} \quad T = 2\pi \sqrt{\frac{L}{mgh}}$$

$$\frac{T}{2\pi} = \sqrt{\frac{L}{mgh}} \quad \checkmark$$

$$\frac{T^2}{4\pi^2} = \frac{L}{mgh} \quad \checkmark$$

$$m = \frac{4\pi^2 L}{T^2 gh} \quad \checkmark$$

Q2d

4 //

Q2e

3 //