



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.
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6. No part of this book is to be torn out; it must be handed in complete.
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Surname Walczak
First name(s) Damian
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1	Student Number	WAL11802290
2	Title of Examination Paper	Mathematics (Test 1)
3	Reference Number of Examination/ Module Number	M4X00391
4	Date and Time of Examination	18.01.2021 14:00
5	Examination Venue	Sports Hall
6	Seat Number	3D

7	Number of Answer Books handed in	1
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List the numbers of the questions you have attempted	Office Use
Q1	
Q2	
Q1	
a	21
b	5
c	4
d	2
e	3
Q2	
a	14
b	9
c	8
d	4
e	0
	70/80

Q1

a)

$$i) \frac{dy}{dx} = 16x^3 + 15x^2 + 4x - 3 \quad \checkmark \quad (2)$$

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

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

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

$$iv) \frac{dy}{dx} = 5 \cos 5x - 12 \sin 2x + 9 \sec^2 3x \quad \checkmark \quad (3)$$

$$v) u = x^3 \quad \checkmark$$

$$\frac{du}{dx} = 3x^2 \quad \checkmark$$

$$v = \cos x \quad \checkmark$$

$$\frac{dv}{dx} = -\sin x \quad \checkmark$$

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

$$vi) \quad u = 2x^2 + 3x \quad \checkmark$$

$$\frac{du}{dx} = 4x + 3 \quad \checkmark$$

$$v = e^{5x} \quad \checkmark$$

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

(5)

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

$$vii) \quad u = e^{2x} \quad \checkmark$$

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

$$v = \sin 2x \quad \checkmark$$

$$\frac{dv}{dx} = 2\cos 2x \quad \checkmark$$

$$\frac{dy}{dx} = e^{2x}(2\cos 2x) + \sin 2x(2e^{2x}) \quad (4) \quad \checkmark$$

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

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

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

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

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

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

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

Q16

5/11

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

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

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

$$(24x) \quad \checkmark \quad \checkmark$$

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

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

$$= 36x^2 + (48 - 4x) + (15 - 8) \quad \checkmark$$

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

Q1c

4

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

$$y'' = -6 \sin 2x \quad \checkmark$$

$$y''' = -12 \cos 2x \quad \checkmark$$

$$y^{(4)} = 24 \sin 2x \quad \checkmark$$

$$y^{(5)} = 48 \cos 2x \quad \checkmark$$

Q1d

2

$$e) \quad y = x^2 - 6x + 5 \quad (1)$$

$$y = x - 3 \quad (2)$$

$$x^2 - 6x + 5 = x - 3 \quad \checkmark$$

$$x^2 - 6x - x + 5 + 3 = 0$$

$$x^2 - 7x + 8 = 0$$

$$x^2 - 8x + 1x + 8$$

$$x(x-8) + 1(x)$$

$$x^2 - 6x - x + 5 + 3 = 0 \quad \checkmark$$

$$x^2 - 7x + 8 = 0 \quad \checkmark$$

$$x^2 + x - 8x + 8 = 0$$

$$x(x+1) + 8(x+1) \quad \times$$

$$(x+8)(x+1)$$

$$x = -8 \quad x = -1 \quad \times$$

$$(2) \quad -8 - 3 = -11$$

$$y = -11$$

Correct method

$$-1 - 3 = -4$$

$$\text{or } y = -4 \quad \times$$

Q2

a)

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

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

$$(3x-5)(3x+4) = (3x-4)(3x-4)$$

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

$$-3x - 20 = -24x + 16$$

$$-3x + 24x = 16 - 20$$

$$21x = -4$$

$$x = -\frac{4}{21}$$

$$x = -0.19$$

Q2a

14

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

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

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

$$2 \cdot 20 + 1 \cdot 10x + 2 \cdot 10 - 0.69x = 1.61x$$

$$4 \cdot 30 + 0.41x = 1.61x$$

$$4 \cdot 30 = 1.61x - 0.41x$$

$$4 \cdot 30 = 1.2x$$

$$4 \cdot 30 = x$$

$$\frac{120}{1.2}$$

$$x = 100$$

$$\text{iii)} \quad \frac{4}{2x+5} = \frac{6}{x+2}$$

$$4(x+2) = 6(2x+5) \quad \checkmark$$

$$4x+8 = 12x+30 \quad \checkmark \quad (3)$$

$$8-30 = 12x-4x \quad \checkmark$$

$$-22 = 8x \quad \checkmark$$

$$\frac{-22}{8} = x \quad \checkmark$$

$$x = -2.75 \quad \checkmark$$

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

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

$$3x+6+14x+2 = x \quad \checkmark$$

$$17x+8 = x$$

$$8 = x-17x \quad \checkmark$$

$$8 = -16x \quad \checkmark$$

$$8 = x \quad \checkmark$$

$$\frac{-16}{-16}$$

$$x = -0.5 \quad \checkmark$$

Q2.b

b)

i)

$$t^2 + 8t + 15$$

$$t^2 + 5t + 3t + 15$$

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

$$(t+3)(t+5) \checkmark$$

factors are 5

(2)

9 //

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

$$5q^2 + 15q + 2q + 6$$

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

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

$$5q+2 \checkmark$$

$$q = -\frac{2}{5}$$

$$q = -3$$

q are given

(2)

$$iii) N^2 - 121$$

$$(n-11)(n+11) \checkmark$$

n=11

n=11

(2)

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

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

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

m=3

m=4n

m=4n

(3)

c)

$$90 = 9 \times 10$$

i)

$$6x^2 + 19x + 15 = 0$$

$$6x^2 + 10x + 9x + 15 = 0$$

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

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

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

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

$$x = -1.5 \quad x = -1.\bar{6}$$

ii)

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

$$24 = 6 \times 4$$

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

$$x^2 + 6x - 4x - 24 = 0$$

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

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

$$x = 4 \quad x = -6 \quad \textcircled{2}$$

iii)

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

$$42 = 3 \times 14$$

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

$$2x^2 + 3x - 14x - 21 = 0$$

$$x(2x+3) - 7(2x+3) = 0$$

$$(x-7)(2x+3) = 0 \quad \textcircled{3}$$

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

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

$$x = -1.5$$

$$d) \quad 6x^2 - 13x - 8 = 0$$

48

Q2d

41

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

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

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

(4)

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

$$\frac{13 \pm \sqrt{361}}{12}$$

$$\frac{13 \pm 19}{12}$$

$$x = 1.983 \quad \text{or} \quad x = 0.683$$

$$x = 2.6 \quad \text{or} \quad x = -0.5$$

e)

$$T = 2\pi \sqrt{\frac{L}{mgn}}$$

$$T = 2\pi \sqrt{\frac{L}{mgn}}$$

$$T + 2\pi \sqrt{\frac{L}{mgn}} = 2L$$

$$T = 2\pi \cdot \left(\frac{L}{mgn}\right)^{\frac{1}{2}}$$

$$T = 2\pi \cdot (mgn + 2L)$$

$$T = 2\pi mgn + 4\pi L$$

$$T = 2\pi (mgn + 2\pi L)$$

$$T = 2\pi (mgn + 2\pi L)$$

$$mgn + 2\pi L$$

$$T - 4\pi L = 2\pi mgn$$

$$T - 4\pi L = \frac{m}{2\pi gn}$$

$$(T - 4\pi L)(2\pi gn) = m$$