



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: White

FORENAME(S): Dannie James

Henry ~~White~~

1	Student Number	WHI15823148
2	Title of Examination Paper	Maths test 1
3	Module Code	GOEN 4001
4	Date and Time of Examination	23/1/23 13:30
5	Examination Venue	Ward 2 Gower College
6	Seat Number	18

7	Number of Answer Books handed in	
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List the numbers of the questions you have attempted	Office Use
Q1a	21
b	6
c	4
d	2
Q2a	8
b	3
c	0
d	6
e	6
Q3	
a	16
b	6
c	4
d	4
Total	86%

96%

Q1921/23

1)

$$i) y = 6x^4 + 5x^3 + 3x^2 + 6x + 7$$

$$\frac{dy}{dx} = 24x^3 + 15x^2 + 6x + 6 \quad \underline{\underline{2}}$$

$$ii) y = \sin 5x + 5\cos 4x + 7\tan 3x$$

$$\frac{dy}{dx} = 5\cos 5x - 20\sin 4x + 21\sec^2 3x \quad \underline{\underline{2}}$$

$$iii) y = 3 + \frac{1}{x^5} + \sqrt[4]{x}$$

$$y = 3 + x^{-5} + x^{\frac{1}{4}}$$

$$\frac{dy}{dx} = -5x^{-6} + \frac{1}{4}x^{-\frac{3}{4}} \quad \underline{\underline{2}}$$

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

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

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

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

$$du = 2\cos 2x$$

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

$$\frac{dy}{dx} = \sin 2x (5e^{5x}) + e^{5x} (2\cos 2x) \quad \underline{\underline{3}}$$

$$v) y = 15(2x^3 + 3)^4$$

$$\frac{dy}{dx} = 60(2x^3 + 3)^3 (6x^2) \quad \underline{\underline{3}}$$

$$vi) y = \sqrt{7x^3 + 5x}$$

$$y = (7x^3 + 5x)^{\frac{1}{2}} \quad \checkmark$$

$$\frac{dy}{dx} = \frac{1}{2}(7x^3 + 5x)^{-\frac{1}{2}} \quad \underline{\underline{1}}$$

Vii) $y = 4x^5 \ln x$

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

$$u = 4x^5$$

$$v = \ln x$$

$$du = 20x^4$$

$$dv = \frac{1}{x}$$

$$\frac{dy}{dx} = 4x^5 \left(\frac{1}{x} \right) + \ln x (20x^4)$$

Viii) $y = \frac{4 \cos 4x}{e^{3x}}$

$$u = 4 \cos 4x$$

$$v = e^{3x}$$

$$du = -16 \sin 4x$$

$$dv = 3e^{3x}$$

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

$$\frac{dy}{dx} = \frac{e^{3x} (-16 \sin 4x) - 4 \cos 4x (3e^{3x})}{(e^{3x})^2}$$

b) $w = 4x^4 + 3x^3y^3 + 2y^2 + 25$

x	y
$\frac{dw}{dx} = 16x^3 + 9x^2y^3$	$\frac{\partial w}{\partial y} = 9x^3y^2 + 4y$
$\frac{\partial^2 w}{\partial x^2} = 48x^2 + 18xy^3$	$\frac{\partial^2 w}{\partial y^2} = 18x^3y + 4$
$\frac{\partial^2 w}{\partial y \partial x} = 27x^2y^2$	$\frac{\partial^2 w}{\partial x \partial y} = 27x^2y^2$

Q16

6/6

6

c) $y = 8x^2 + 6x - 15$

$\frac{dy}{dx} = 16x + 6$ ✓

$\frac{d^2y}{dx^2} = 16$ ✓

$3(16) + 2(16x + 6) - 32x - 60 = 0$
 ~~$48 + 32x$~~

$48 + 32x + 12 - 32x - 60 = 0$ ✓

$60 + 32x - 32x - 60 = 0$ ✓

$0 = 0$
✓ ✓

~~$8 \times 5 = 4$~~

~~$120 = 120 \times 1$~~

~~$= 60 \times 2$~~

~~$= 40 \times 3$~~

~~$= 30 \times 4$~~

~~$= 24 \times 5$~~

~~$= 20 \times 6$~~

~~$= 15 \times 8$~~

~~$= 10 \times 12$~~

Q1c

4/4

a) $y = 2 \cos 3x$

$\frac{dy}{dx} = -6 \sin 3x$ ✓

$\frac{d^2y}{dx^2} = -18 \cos 3x$ ✓

$\frac{d^3y}{dx^3} = 54 \sin 3x$ ✓

$\frac{d^4y}{dx^4} = 162 \cos 3x$ ✓

Q1d

2/2

2)

a)

$$\frac{2x+5}{(x-2)(x+1)} = \frac{A}{(x-2)} + \frac{B}{(x+1)} \quad \checkmark$$

$$\cancel{(x-2)} \cancel{(x+1)} \frac{2x+5}{\cancel{(x-2)} \cancel{(x+1)}} = \cancel{(x-2)} \cancel{(x+1)} \frac{A}{\cancel{(x-2)}} + \cancel{(x-2)} \cancel{(x+1)} \frac{B}{\cancel{(x+1)}} \quad \checkmark$$

$$2x+5 = (x+1)A + (x-2)B \quad \checkmark$$

$$2x+5 = A(x+1) + B(x-2) \quad \checkmark$$

$$\text{let } x = -1 \quad \checkmark$$

$$2(-1)+5 = B(-1-2) \quad \checkmark$$

$$-2+5 = B-3 \quad \checkmark$$

$$3 = -3B \quad \checkmark$$

$$\frac{3}{-3} = B \quad \checkmark$$

$$-1 = B \quad \checkmark$$

$$-1 = B \quad \checkmark$$

$$\text{let } x = +2 \quad \checkmark$$

$$2(2)+5 = A(2+1) \quad \checkmark$$

$$9 = A3 \quad \checkmark$$

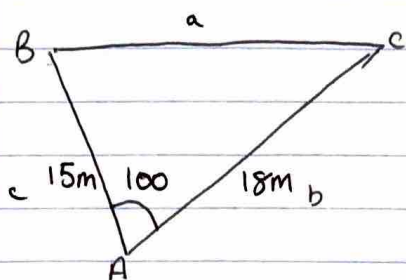
$$\frac{9}{3} = A \quad \checkmark$$

$$3 = A \quad \checkmark$$

$$3 = A \quad \checkmark$$

Q29

8/10

b)
i)

$$a^2 = b^2 + c^2 - 2bc (\cos A) \checkmark$$

$$a^2 = (18)^2 + (15)^2 - 2(18)(15)(\cos 100) \checkmark$$

$$a^2 = 642.77 \checkmark$$

$$a = \sqrt{642.77} \checkmark$$

$$a = 25.35m. \checkmark$$

$$14.77$$

Q2b3/4

ii)

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{25.35}{\sin 100} = \frac{15}{\sin C} \checkmark$$

$$\frac{25.74}{\sin C} = \frac{15}{\sin C} \checkmark$$

$$\sin C =$$

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{25.35}{\sin 100} = \frac{18}{\sin B} \checkmark$$

$$\sin B (25.35) = 18 \times \sin 100 \checkmark$$

$$\sin B = 0.69 \checkmark$$

$$B = \sin^{-1} 0.69 \checkmark$$

$$B = 43.63 \checkmark$$

$$* 6 = 6xt. \checkmark$$

$$\hat{BCA} = ?$$

c)

$$x^2 - 5x + 6$$

$$x^2 + x - 6x + 6$$

$$x(x+1) - 6(x+1) \checkmark$$

$$(x-6)(x+1) \checkmark$$

$$\tan x - 6 = 0$$

$$\tan x = 6 \checkmark$$

$$x = \tan^{-1} 6$$

$$x = 80.53^\circ$$

$$180 + 80.53 = 260.53^\circ$$

$$\tan x + 1 = 0$$

$$\tan x = -1$$

$$x = \tan^{-1} -1 \checkmark$$

$$x = -45 \rightarrow \text{not solution}$$

$$x = 180 - 45 = 135^\circ$$

$$x = 360 - 45 = 315^\circ \checkmark$$

S/A
T/C

Q2c0ii
(cont:)

$$* 100 + 43.63 = 143.63$$

$$180 - 143.63 = 36.37^\circ \checkmark$$

$$\hat{BCA} = 36.37^\circ \checkmark$$

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

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

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

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

$$\frac{-(-b) \pm \sqrt{(-b)^2 - (4ac)}}{2a}$$

6

$$a = 1$$

$$b = -7$$

$$c = 8$$

$$+x = 5.56 \quad \checkmark$$

$$-x = 1.44 \quad \checkmark$$

$$y = (5.56) - 3 = 2.56 \quad \checkmark$$

$$y = (1.44) - 3 = -1.56 \quad \checkmark$$

$$(5.56, 2.56) \quad (1.44, -1.56)$$

e)

i)

$$\sin x = 0.85$$

$$x = \sin^{-1} 0.85 \quad \checkmark$$

$$x = 58.21^\circ \quad \checkmark$$

$$x = 180 - 58.21 = 121.79^\circ \quad \checkmark$$

S	A
T	C

ii)

$$5 \cos x = 4$$

$$\cos x = \frac{4}{5} \quad \checkmark$$

$$x = \cos^{-1} \frac{4}{5} \quad \checkmark$$

$$x = 36.86^\circ \quad \checkmark$$

$$x = 180 + 36.86 = 216.86$$

$$x = \cancel{180 + 36.86} \quad x = 360 - 36.86 = 323.14^\circ$$

iii)

$$\tan x = -0.8 \quad \checkmark$$

$$x = \tan^{-1} -0.8 \quad \checkmark$$

$$x = -38.65 \rightarrow \text{Not solution} \quad \checkmark$$

$$x = 180 - 38.65 = 141.35^\circ \quad \checkmark$$

$$x = 321.35^\circ \quad \checkmark$$

Q2d

6/6

Q2e

6/7

3)

$$i) \ln x + \ln(x-2) = \ln(x+10)$$

$$\ln x (x-2) = \ln(x+10) \checkmark$$

$$(x)(x-2) = (x+10) \checkmark$$

$$x^2 - 2x = x + 10 \checkmark$$

$$x^2 - 2x - x - 10 = 0 \checkmark$$

$$\cancel{(x-5)} \cancel{(x+2)}$$

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

$$(x-5) \checkmark (x+2) \checkmark$$

$$x-5=0 \text{ or } x+2=0 \checkmark$$

$$x=5 \checkmark$$

$$x = -2 \text{ not a solution}$$

$$ii) \log(3x+2) + \log(x+1) = \log 12$$

$$\log(3x+2)(x+1) \checkmark = \log 12 \checkmark$$

$$(3x+2)(x+1) = 12 \checkmark$$

$$3x^2 + 3x + 2x + 2 = 12 \checkmark$$

$$3x^2 + 5x + 2 - 12 = 0 \checkmark$$

$$3x^2 + 5x - 10 = 0 \checkmark$$

$$\frac{-(b) \pm \sqrt{(b)^2 - (4ac)}}{2a} \checkmark$$

$$a = 3 \checkmark$$

$$b = 5 \checkmark$$

$$c = -10 \checkmark$$

$$+x = 1.17 \checkmark$$

$$-x = -2.84 \text{ not a solution}$$

$$iii) 4^{(1-2x)} \times 6^{(3x+4)} = 12^{(5x)}$$

$$\log 4^{(1-2x)} \times \log 6^{(3x+4)} = \log 12^{(5x)} \checkmark$$

$$(1-2x) \log 4 + (3x+4) \log 6 = (5x) \log 12 \checkmark$$

$$(1-2x) 0.6 + (3x+4) 0.77 = (5x) 1.08 \checkmark$$

$$0.6 - 1.2x + 2.31x + 3.08 = 5.4x \checkmark$$

$$0.6 + 3.08 = 5.4x - 2.31x + 1.2x \checkmark$$

$$3.68 = 4.29x \checkmark$$

$$\frac{3.68}{4.29} = x$$

$$0.86 = x \checkmark$$

Q3a

16/18

$$iv) \quad \frac{2x-2}{3x+9} = \frac{4}{3}$$

$$3(2x-2) = 4(3x+9)$$

$$6x - 6 = 12x + 36$$

$$-6 - 36 = 12x - 6x$$

$$-42 = 6x$$

$$\frac{-42}{6} = x$$

$$-7 = x$$

$$v) \quad \frac{(x+4)}{9} + \frac{(2x+1)}{7} = 12$$

$$63 \frac{(x+4)}{9} + 63 \frac{(2x+1)}{7} = 63(12)$$

$$7(x+4) + 9(2x+1) = 756$$

$$7x + 28 + 18x + 9 = 756$$

$$25x = 756 - 28 - 9$$

$$25x = 719$$

$$x = \frac{719}{25}$$

$$x = 28.76$$

$$b) \quad i) \quad z^2 - 9z + 14$$

$$z^2 - 2z - 7z + 14$$

$$z(z-2) - 7(z-2)$$

$$(z-7)(z-2)$$

$$14 = 7 \times 2$$

Q3b

61b

ii) $q^2 - 81$
 $(q - 9)(q + 9)$

iii) $12xu - 3xv + 28yu - 7yv$
 $(12xu - 3xv) + (28yu - 7yv)$
 $3x(4u - v) + 7y(4u - v)$
 $(3x + 7y)(4u - v)$

c)

i) $8m^2 - 2m - 21 = 0$

$8m^2 + 12m - 14m - 21 = 0$

$4m(2m + 3) - 7(2m + 3) = 0$
 $(4m - 7)(2m + 3) = 0$

$4m - 7 = 0$

$4m = 7$

$m = \frac{7}{4}$

$m = 1.75$

or $2m + 3 = 0$

$2m = -3$

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

$m = -1.5$

$8 \times 21 = 168$

$14 \times 12 = 168$

Q3C4/4

ii) $w^2 + 13w + 40 = 0$

$w^2 + 8w + 5w + 40 = 0$

~~$w^2 + 8w$~~
 $w(w + 8) + 5(w + 8)$
 $(w + 5)(w + 8)$

$w + 5 = 0$

$w = -5$

or $w + 8 = 0$

$w = -8$

$40 = 1 \times 40$

$= 2 \times 20$

$= 4 \times 10$

$= 5 \times 8$

a) $6x^2 - 8x - 30 = 0$

$$\frac{-(-8) \pm \sqrt{(-8)^2 - (4 \times 6 \times -30)}}{2 \times 6}$$

$a = 6$

$b = -8$

$c = -30$

$$\frac{-(-8) \pm \sqrt{(-8)^2 - (4 \times 6 \times -30)}}{2 \times 6}$$

$+x = 3$

$-x = -1.6$

Q3d

4/4