



Prifysgol Cymru
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Trinity Saint David

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)

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1	Student Number	DAV22868331
2	Title of Examination Paper	Mathematics Test 1
3	Module Code	EOEN4001
4	Date and Time of Examination	20/01/2025
5	Examination Venue	Hill House
6	Seat Number	F 7
7	Number of Answer Books handed in	1

List the numbers of the questions you have attempted	Office Use
Q1	
a	18 ✓
b	6 ✓
c	4 ✓
d	2 ✓
Q2 a	0 ✓
b	2 ✓
c	3 ✓
d	0 ✓
e	4 ✓
Q3 a	16 ✓
b	6 ✓
c	1 ✓
d	3 ✓
Total	65/100 ✓

(Gweler yr ochr arall am y fersiwn Cymraeg)

RK

65%

a)

$$i) y = 3x^4 + 5x^3 + 4x^2 + 7x - 10$$

$$y' = 12x^3 + 15x^2 + 8x + 7 \quad \checkmark \quad \underline{\underline{2}}$$

Q130/35

$$ii) y = \frac{1}{x^3} + \frac{1}{\sqrt[5]{x^2}} - 2\pi x$$

$$y = x^{-3} + x^{-2/5} - 2\pi x \quad \checkmark$$

$$y' = \frac{-3}{x^4} - \frac{2}{5\sqrt[5]{x^7}} - 2\pi \quad \checkmark \quad \underline{\underline{2}}$$

Q1a18/22

$$iii) y = 2\sin(2x) + 3\cos(3x) + \frac{1}{5}\tan(5x)$$

$$y' = 4\cos(2x) - 9\sin(3x) + \sec^2(5x) \quad \underline{\underline{3}}$$

$$iv) y = 7x^3\sin(5x)$$

$$y' = 21x^2\sin(5x) + 35x^3\cos(5x) \quad \underline{\underline{4}}$$

$$v) y = \frac{2\sin(5x)}{3e^{5x}}$$

$$y' = \frac{3e^{5x}(10\cos(5x)) - 2\sin(5x)(15e^{5x})}{(3e^{5x})^2}$$

$$y' = \frac{30e^{5x}\cos(5x) - 30\sin(5x)e^{5x}}{(3e^{5x})^2} \quad \underline{\underline{4}}$$

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

$$y = (10x^3 + 20)^3 \quad \times$$

$$y' = 3(10x^3 + 20)^2(30x^2) \quad \times$$

vii

$$y = \sqrt[3]{(x^4+5)^2}$$

$$y = (x^4+5)^{2/3}$$

$$y' = \frac{2}{3} (x^4+5)^{-1/3} (4x^3)$$

$$y' = \frac{8x^3}{3 \sqrt[3]{(x^4+5)}}$$

b)

The variable w is related to the variable x and y by following:

$$w = 5x^5 + 4x^2y^4 + 3y^3 + \sin(x) - 5$$

$$\frac{\partial w}{\partial x} = 25x^4 + 8xy^4 + \cos(x)$$

$$\frac{\partial^2 w}{\partial x^2} = 100x^3 + 8y^4 - \sin(x)$$

$$\frac{\partial^2 w}{\partial y \partial x} = 32xy^3$$

$$\frac{\partial w}{\partial y} = 16x^2y^3 + 9y^2$$

$$\frac{\partial^2 w}{\partial y^2} = 48x^2y^2 + 18y$$

$$\frac{\partial^2 w}{\partial x \partial y} = 32xy^3$$

~~You used correct method to solve the question, but you copied it incorrectly from the exam paper.~~

Q1b

6/6

c) $y = \cos(2x) + x^2$

show that

$$\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = 4x^2 - 8x + 8\sin(2x) + 2$$

* $y = \cos(2x) + x^2$

$$y' = -2\sin(2x) + 2x$$

$$y'' = -4\cos(2x) + 2$$

$$\Rightarrow -4\cos(2x) + 2 - 4(-2\sin(2x) + 2x) + 4y =$$

$$\Rightarrow -4\cos(2x) + 2 + 8\sin(2x) - 8x + 4(\cos(2x) + x^2)$$

$$\Rightarrow -4\cos(2x) + 2 + 8\sin(2x) - 8x + 4\cos(2x) + 4x^2$$

$$\therefore \Rightarrow 4x^2 - 8x + 8\sin(2x) + 2 = 4x^2 - 8x + 8\sin(2x) + 2$$

d) Find the 3th derivative of

$$y = xe^{2x}$$

$$y' = e^{2x} + 2xe^{2x}$$

$$y'' = e^{2x} + 2e^{2x} + 4xe^{2x}$$

$$y''' = e^{2x} + 4e^{2x} + 4e^{2x} + 8xe^{2x}$$

Q1c

4/4

Q1d

2/3

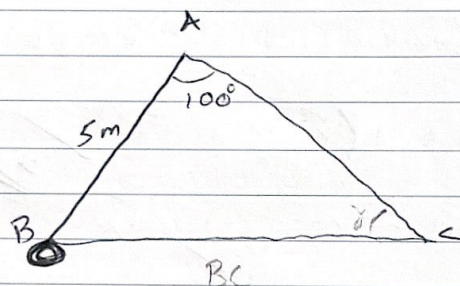
Question Two

a) Express $\frac{3x-4}{(x+2)(x-5)}$

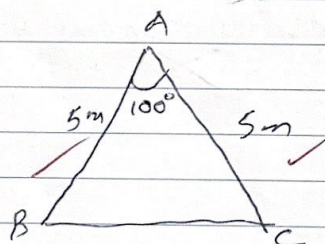
$$\frac{f(x)}{(x+a)(x+b)} = \frac{A(3x-4)}{x+2} + \frac{B}{x-5}$$

$$\text{So } \frac{f(x)}{(x+a)(x+b)} = \frac{3Ax-4A}{x+2} + \frac{B}{x-5}$$

b)



assuming the side AC = 5m



$$BC = 5.80 \text{ m}$$

$$BC^2 = 5^2 + 5^2 - 2(5)(5)(\cos 100^\circ)$$

$$BC^2 = 5^2 + 5^2 - 2(5)(5)(\cos 100^\circ)$$

$$BC^2 = 25 + 8.68240$$

$$BC = \sqrt{33.6824}$$

$$BC = 5.8036 \text{ m}$$

error carried forward.

c) Factorise $x^2 - 6x + 8$
 $(\tan x - 2)(\tan x - 4) = 0$
 $\tan x = 2$; $\tan x = 4$
 $x = \tan^{-1}(2)$; $x = \tan^{-1}(4)$
 $x = 63.4349^\circ$; $x = 75.9637^\circ$
 $x = 296.565^\circ$; $x = 284.0362^\circ$
 $63.4349^\circ \leq x \leq 296.565^\circ$; $75.9637^\circ \leq x \leq 284.0362^\circ$

Q2c3/6

d) $y = x^2 \rightarrow M$

line $y = x + 2 \rightarrow N$

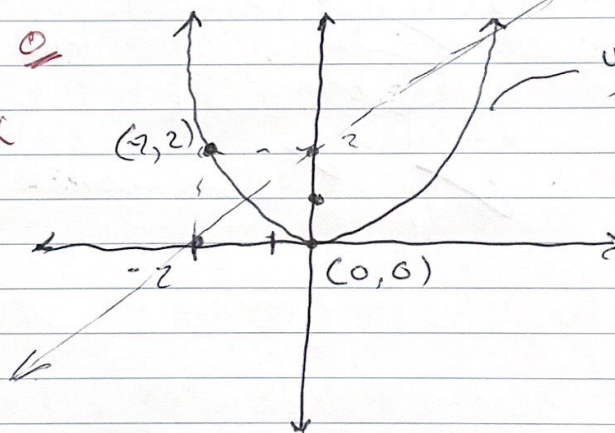
$I_x \rightarrow y = 0$

$x + 2 = 0$
 $x = -2$

$I_y \rightarrow x = 0$

$y = (0)^2$
 $y = 0$

$y = 2$

Q2d0/6

$M = y$

$y' = 2x$

e) i) $\sin x = 0.6$

$x = \sin^{-1}(0.6) \checkmark \therefore 36.86989^\circ \leq x \leq 323.1301024^\circ$

$x = 36.86989^\circ \checkmark$

$x = 323.1301024^\circ \checkmark$

Q2e

4/7

ii) $7 \cos x = 6 \quad \therefore 31.0027^\circ \leq x \leq 328.9972^\circ$

$x = \cos^{-1}(6/7) \checkmark$

$x = 31.0027^\circ \checkmark$

$x = 328.9972^\circ \checkmark$

iii) $-3 \tan x = 2 \checkmark \therefore 146.31^\circ \leq x \leq 393.69006^\circ$

$x = \tan^{-1}(-2/3) = -33.69^\circ$

not a solution

$x = 393.69006^\circ \checkmark$

$x = 146.31^\circ \checkmark$

show workings

Question Three

$$i) \ln(x^2 + 2x) = \ln(3) + \ln(x+1)$$

$$\cancel{\ln}(x^2 + 2x) = \cancel{\ln}(3(x+1))$$

$$x^2 + 2x = 3x + 3$$

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

$$x = \frac{-(-1) \pm \sqrt{(-1)^2 - (1)(-3)}}{2(1)}$$

$$x = \frac{1 \pm \sqrt{13}}{2}$$

$$x = \frac{1 + \sqrt{13}}{2}$$

$$x = \frac{1 - \sqrt{13}}{2}$$

not a valid solution

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

$$\log[(x+3)(2x+1)] = \log(3x-1)^2$$

$$2x^2 + 7x + 3 = 9x^2 - 6x + 1$$

$$7x^2 - 13x - 2 = 0$$

$$x = \frac{-(-13) \pm \sqrt{(-13)^2 - 4(7)(-2)}}{2(7)}$$

$$x = \frac{13 \pm \sqrt{225}}{14}$$

$$x = \frac{13 + 15}{14}$$

$$x = 2$$

$$x = \frac{13 - 15}{14}$$

$$x = -\frac{1}{7}$$

not a valid solution

Q3

26/32

Q3a

16/18

3

3

$$\text{iii)} \quad 5^{(x+2)} \times 2^{(2-x)} = 3^{(x+3)}$$

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

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

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

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

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

$$x = \frac{3\ln 3 - 2\ln 5 - 2\ln 2}{\ln 5 - \ln 2 - \ln 3} = \frac{-1.309333}{-0.18232556}$$

$$x = 7.181449$$

$$\text{iv)} \quad \frac{5x+2}{2x-3} = \frac{3}{4}$$

$$4(5x+2) = 3(2x-3)$$

$$20x+8 = 6x-9$$

$$14x = -17$$

$$x = -17/14$$

$$\checkmark \quad \frac{(3x-2)}{4} + \frac{(x+5)}{2} = \frac{7}{3}$$

$$8 \left[\frac{(3x-2)}{4} + \frac{(x+5)}{2} \right] \left[\frac{7}{3} \right] 8 \checkmark$$

$$2(3x-2) + 4(x+5) = \frac{56}{3} \checkmark$$

$$6x - 4 + 4x + 20 = \frac{56}{3}$$

$$10x + 16 = \frac{56}{3} \quad \underline{\underline{3}}$$

$$10x = \frac{56}{3} - 16$$

$$10x = \frac{8}{3} \checkmark$$

$$x = \frac{8}{30} = \frac{4}{15} \checkmark$$

b) $z^2 - 12z + 35$

i) $(z-5)(z-7) \quad \underline{\underline{2}}$

Q3b

6/6

ii) $m^2 - 121$

$$m = \pm \sqrt{121}$$

$$m = \pm 11$$

or

$$(m+11)(m-11) \quad \underline{\underline{2}}$$

iii) $KL + 2Km + 5nL + 10nm$

$$(KL + 5nL) + (2Km + 10nm) \quad \underline{\underline{2}}$$

$$L(K+5n) + 2m(K+5n)$$

$$(L+2m)(K+5n) \quad \checkmark$$

c) i) $4p^2 + 11p + 6 = 0$

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

$p = ?$

$x = 0$

Q3c

1/4

ii) $s^2 + 16s + 63 = 0$

$(s + 7)(s + 9) = 0$

$s = ?$

$s = ?$

d)

$3x^2 + 4x - 10 = 0$

$$x = \frac{-4 \pm \sqrt{(4)^2 - 4(3)(-10)}}{2(3)}$$

$x = \frac{-4 \pm \sqrt{136}}{6}$

$x = \frac{-4 + \sqrt{136}}{6}$

$x = \frac{-4 - \sqrt{136}}{6}$

Q3d

3/4