



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)

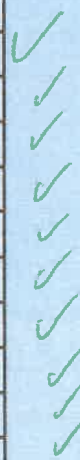
SURNAME: TAYLOR

FORENAME(S): COREY

1	Student Number	1708443 ~~708443~~
2	Title of Examination Paper	MATHEMATICS TEST 1
3	Module Code	~~M4X00591~~ M4X00591
4	Date and Time of Examination	10/1/18 14:00HRS
5	Examination Venue	HILL HOUSE IT 2, GOWER COLLEGE
6	Seat Number	8
7	Number of Answer Books handed in	1

List the numbers of the questions you have attempted	Office Use
1	
3	
Q2 a	6
b	3
c	14
d	2
e	2
Q3 a	20
b	4
c	3
d	6
e	5
Office Use	65/80

Test 1



81 %



1)

$$a) i) \frac{4}{2x+1} = \frac{5}{x-1}$$

$$4(x-1) = 5(2x+1) \quad \checkmark \textcircled{1}$$

~~$$4x - 4 = 10x + 5$$~~
~~$$4x - 10x = 5 + 4$$~~
~~$$-6x = 9$$~~
~~$$x = 9/-6$$~~
~~$$x = -9/6$$~~

$$4x - 4 = 10x + 5 \quad \checkmark$$

$$4x - 10x = 5 + 4$$

$$-6x = 9 \quad \checkmark$$

$$x = 9/-6 \quad \checkmark$$

$$x = -9/6 \quad \checkmark \textcircled{2}$$

$$ii) \frac{(x+2)}{6} - \frac{(2x+3)}{3} = \frac{x}{12} \quad \therefore (\times 3)$$

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

$$2x + 4 - 2x - 3 = 4x$$

~~$$4 - 3$$~~

$$4 - 3$$

$$1$$

$$\therefore 4x$$

$$x$$

~~$$4x - 2x + 2x$$~~

$$= 4x - 2x + 2x$$

$$= 4x$$

$$= 1$$

$$= \underline{\underline{1/4}} \quad \text{OR} \quad \underline{\underline{0.25}} \quad \checkmark$$

$$iii) 2^{x+1} = 5^x \times 3$$

$$\log(2^{x+1}) = \log(5^x \times 3) \quad \checkmark \textcircled{1}$$

$$\log(2^{x+1}) = \log(5^x) + \log(3)$$

$$(x+1) \log 2 = (x) \log 5 + \log 3 \quad \checkmark \textcircled{1}$$

$$(x+1) 0.301 = (x) 0.698 + 0.477 \quad \checkmark$$

$$0.301x + 0.301 = 0.698x + 0.477 \quad \checkmark \textcircled{1}$$

$$0.301x - 0.698x = 0.477 - 0.301$$

$$-0.397x$$

$$x$$

$$= 0.176$$

$$= -0.176 / 0.397 \quad \checkmark \textcircled{1}$$

$$\underline{\underline{-0.443}}$$

P.T.O

i) a) iv)

$$\log_a (x+3) + \log_a (2x+1) = 2 \log_a (3x-1)$$

$$b) \quad 2V = \frac{P+Q}{3P-T}$$

∴ make 'P' Subject.

$$\therefore 2V(3P-T) = P+Q \quad \checkmark \textcircled{1}$$

$$\therefore 2V(3P-T) - Q = P$$

when $V = 2$, $Q = 3$ and $T = -1$:-

$$P = 2(2)(3(P) - -1) - 3$$

$$P = 2(2)(3P+1) - 3$$

$$P = 4(3P+1) - 3$$

$$P = 12P + 4 - 3$$

$$P = 12P + 1$$

$$-1 = 11P$$

$$-1/11 = P$$

$$\therefore P = \underline{\underline{-1/11}} \text{ OR } \underline{\underline{-0.09}}$$

(2, D.P.)
?

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1) c) i)

$$2x^2 + 11x + 12 = 0$$

$$2x^2 + 8x + 3x + 12 = 0 \quad \checkmark$$

$$2x(x+4) + 3(x+4) = 0$$

$$(2x+3)(x+4) = 0 \quad \checkmark \textcircled{1}$$

$$\underline{24}$$

$$1 \times 24$$

$$2 \times 12$$

$$\boxed{3 \times 8}$$

$$4 \times 6$$

$$2x+3=0$$

OR

$$x+4=0$$

$$2x = -3$$

$$x = -4$$

$$x = -\frac{3}{2} \quad \checkmark \textcircled{1}$$

$$\textcircled{2}$$

$$\text{ii) } x^2 - 28 = 3x$$

$$x^2 - 3x - 28 = 0 \quad \checkmark \textcircled{1}$$

$$x^2 + 4x - 7x - 28 = 0 \quad \checkmark$$

$$x(x+4) - 7(x+4) = 0 \quad \checkmark \textcircled{2}$$

$$(x-7)(x+4) = 0$$

$$\underline{28}$$

$$1 \times 28$$

$$2 \times 14$$

$$4 \times 7$$

$$x-7=0$$

OR

$$x+4=0 \quad \textcircled{1}$$

$$x = \underline{7} \quad \checkmark \textcircled{2}$$

$$\cancel{x} = \underline{-4} \quad \checkmark$$

$$\text{iii) } -4 = -x - 3x^2$$

$$3x^2 + x - 4 = 0 \quad \checkmark \textcircled{1}$$

$$3x^2 - 3x + 4x - 4 = 0 \quad \checkmark$$

$$\cancel{3x^2 - 3x + 4x - 4}$$

$$3x(x-1) + 4(x-1) = 0$$

$$(3x+4)(x-1) = 0 \quad \checkmark \textcircled{2}$$

$$\underline{12}$$

$$1 \times 12$$

$$2 \times 6$$

$$3 \times 4$$

$$3x+4=0$$

OR

$$x-1=0$$

$$3x = -4$$

$$x = \underline{1}$$

$$x = -\frac{4}{3} \quad \checkmark$$

$$\textcircled{1}$$

$$\checkmark \textcircled{2}$$

P.T.O

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1) d) i)

~~$5k^2 + 16k - 3$~~

$$5k^2 + 16k - 3$$

$$k(5k + 16) - 3$$

$$(5k + 16)(k - 3)$$

~~$5k^2 + 16k - 3$~~

ii) $U^2 - 4F^2$

?

$$\begin{aligned} \text{iii) } xy - xr + ky - kr \\ x(y-r) + k(y-r) \\ (x+k)(y-r) \end{aligned}$$

e) $x = 2, x = -3$

$$\begin{aligned} \therefore (x-2)(x+3) &= 0 \\ x^2 + 3x - 2x - 6 &= 0 \\ x^2 + x - 6 &= 0 \end{aligned}$$

3) a) i)

$$y = 5x^4 + 3x^2 - x + 1$$

~~$$\frac{dy}{dx} = 20x^3 + 6x - 1$$~~

$$\frac{dy}{dx} = 20x^3 + 6x - 1$$

3/4 ✓

ii)

$$y = (2x+3)^2$$

$$\frac{dy}{dx} = 2(2x+3) \cdot 2$$

$$\therefore = 4(2x+3)$$

3/4 ✓

iii)

$$y = x\sqrt{x} + \frac{2}{\sqrt[3]{x}}$$

$$y = x \cdot x^{1/2} + \frac{2}{x^{1/3}}$$

~~$$y = x \cdot x^{1/2} + 2x^{-1/3}$$~~

$$y = x \cdot x^{1/2} + 2x^{-1/3}$$

$$y = x^{3/2} + 2x^{-1/3}$$

$$\frac{dy}{dx} = \frac{3}{2}x^{1/2} - \frac{2}{3}x^{-4/3}$$

3/4 ✓

iv)

$$y = \sin 2x - 3\cos 4x - \tan^2 x/2$$

$$\frac{dy}{dx} = 2\cos(2x) + 12\sin(4x) - \frac{1}{2}\sec^2(x/2)$$

3/4 ✓

v)

$$y = \frac{\sin 5x}{e^{2x} + 3x^2} \therefore u$$

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

$$\therefore \frac{dy}{dx} = \frac{(e^{2x} + 3x^2) \cdot 5\cos(5x) - \sin(5x) \cdot (2e^{2x} + 6x)}{(e^{2x} + 3x^2)^2}$$

~~$$V = e^{2x} + 3x^2$$~~

$$V = e^{2x} + 3x^2$$

$$\frac{du}{dx} = 5\cos(5x)$$

$$u = \sin 5x$$

$$\frac{dv}{dx} = 2e^{2x} + 6x$$

$$v^2 = (e^{2x} + 3x^2)^2$$

P.T.O

5/4 ✓

3) a) vi)

$$y = \sqrt{6x^3 - 2x + 1}$$

?

?

vii)

$$y = 3x^2 \ln x$$

$$y = 3x^2 \cdot \ln x$$

$$\left(\text{Product Rule} \right)$$

$$\frac{dy}{dx} = U \left(\frac{dv}{dx} \right) + V \left(\frac{du}{dx} \right)$$

$$U = \ln x$$

$$\frac{dv}{dx} = 6x$$

$$V = 3x^2$$

$$\frac{du}{dx} = \frac{1}{x}$$

~~$$\frac{dy}{dx} = \ln x (6x) + 3x^2 \left(\frac{1}{x} \right)$$~~

$$\frac{dy}{dx} = \ln x (6x) + 3x^2 \left(\frac{1}{x} \right)$$

$$* b) y = 4x^2 + 3x - 5$$

$$3 \left(\frac{d^2y}{dx^2} \right) + 2 \left(\frac{dy}{dx} \right) - 30 - 16x = 0$$

$$\frac{dy}{dx} = 8x + 3$$

$$\frac{d^2y}{dx^2} = 8$$

$$\therefore 3(8) + 2(8x + 3) - 30 - 16x = 0$$

$$24 + 16x + 6 - 30 - 16x = 0$$

$$24 + 16x + 6 - 30 - 16x = 0$$

$\therefore x$ terms cancel.

$$24 + 6 - 30 = 0$$

$$\therefore 30 - 30 = 0$$

$\therefore$ Numbers cancel $\therefore (0 = 0)$

* Question has no 'y', assumed as 'y'.

3) c)

4th Derivative of $y = \sin 2x$

$$1^{st} \left(\frac{dy}{dx} \right) = 2 \cos(2x) \checkmark$$

$$2^{nd} \left(\frac{d^2y}{dx^2} \right) = -4 \sin(2x) \checkmark \textcircled{1}$$

$$3^{rd} \left(\frac{d^3y}{dx^3} \right) = -8 \cos(2x) \checkmark \textcircled{2}$$

$$4^{th} \left(\frac{d^4y}{dx^4} \right) = \underline{\underline{+16 \sin(2x)}} \checkmark \textcircled{1}$$

$$d) \quad z = x^3 y^5 + 2x^4 y + 3x^2 - 2y^3 + 10$$

$$\frac{dz}{dx} = 3x^2 y^5 + 8x^3 y + 6x \checkmark \textcircled{1}$$

$$\frac{d^2z}{dx^2} = 6xy^5 + 24x^2 y + 6 \checkmark \textcircled{1}$$

$$\frac{dz}{dy} = 5x^3 y^4 + 2x^4 - 6y^2 \checkmark \textcircled{1}$$

$$\frac{d^2z}{dy^2} = 20x^3 y^3 - 12y \checkmark \textcircled{1}$$

Also, to prove :-

$$\frac{d^2z}{dy \cdot dx} = 15x^2 y^4 + 8x^3 \checkmark \textcircled{1}$$

$$\frac{d^2z}{dx \cdot dy} = 15x^2 y^4 + 8x^3 \checkmark \textcircled{1}$$

AND

BOTH SAME.

P.T.O.

3) e)

$$y = 5x - 1$$

$$y = 2x^2 - 2x + 5$$

$$\therefore 2x^2 - 2x + 5 = 5x - 1 \quad \checkmark \textcircled{1}$$

$$2x^2 - 2x - 5x + 5 + 1 = 0 \quad \checkmark$$

$$2x^2 - 7x + 6 = 0 \quad \checkmark \textcircled{1}$$

$$2x^2 - 3x - 4x + 6 = 0$$

~~$$2x^2 - 3x - 4x + 6 = 0$$~~

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

$$(x - 2)(2x - 3) = 0 \quad \checkmark \textcircled{1}$$

$$x - 2 = 0 \quad \checkmark$$

$$x$$

$$= 2$$

①

OR

$$2x - 3 = 0 \quad \checkmark$$

$$2x$$

$$= 3$$

$$x$$

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

①

when $x = 2$, $y = 5(2) - 1$
 $y = 10 - 1$
 $y = \underline{9}$

when $x = \frac{3}{2}$, $y = 5\left(\frac{3}{2}\right) - 1$
 $y = 7.5 - 1$
 $y = \underline{6.5}$ ✓

Co-ordinates would be : (2, 9) & (1.5, 6.5)