



12 Pages

1. Please give the information requested in the boxes below.
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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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Complete, fold and seal
(see note 2 below)

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FORENAME(S): ELLIOT

SCOTT

1	Student Number	1707681
2	Title of Examination Paper	MODULE CODE N4x00391 MATHEMATICS TEST ONE
3	Module Code	9 N4x00391
4	Date and Time of Examination	10-1-18 14.00
5	Examination Venue	Hill house IT2 GOWER COLLEGE
6	Seat Number	4
7	Number of Answer Books handed in	1

List the numbers of the questions you have attempted	Office Use
1	
3	
Q1 a	8
b	0
c	14
d	3
e	2
Q3 a	16
b	3
c	3
d	6
e	1
Office Use	56/80

Test 1

✓
✓
✓
✓
✓
✓
✓
✓
✓
✓

70%

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

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

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

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

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

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

$$x = -\frac{9}{6}$$

$$\frac{-9}{6} = -\frac{3}{2} \quad \checkmark \quad \text{or} \quad -1.5 \quad \checkmark \quad (1)$$

ii) $\left[\frac{(x+2)}{6} - \frac{(2x+3)}{3} = \frac{x}{12} \right] \times 12 \quad \checkmark$

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

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

$$2x+4 - 8x + 12 = x$$

$$-6x + 16 = x$$

$$x + 6x = 16$$

$$7x = 16$$

$$x = \frac{16}{7}$$

$$\frac{16}{7} = 2.28$$

$$x = 2.28$$

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

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

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

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

$$(0.69)x + (0.48) = (0.30)x + 1 \quad \checkmark$$

$$0.69x + 0.48 = 0.30x + 0.30 \quad \checkmark$$

$$0.69x + 0.48 - 0.30x = 0.30 - 0.48$$

~~$$0.39x$$~~
$$0.69x - 0.30x = 0.30 - 0.48 \quad (1)$$

$$0.39x = -0.18$$

$$\frac{-0.18}{0.39} = -0.46 \quad x = -0.46 \quad (1)$$

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

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

$$(x+3)(2x+1) = 6x-2$$

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

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

$$2x^2 + 1x + 5 = 0$$

$$2x^2 + 1x - 10x + 5 = 0$$

$$2x(x+5) - 10(x-1) = 0$$

$$\begin{array}{r} 10 \\ 1 \times 10 \\ 2 \times 5 \end{array}$$

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

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

$$-T(2V) - Q = \frac{P}{3P} = 0.3P$$

$$0.3P = -T(2V) - Q$$

$$0.3P = 1(2 \times 2) - 3$$

$$0.3P = 4 - 3$$

$$0.3P = 1$$

$$P = \frac{1}{0.3}$$

$$0.3 = 3.3$$

$$P = 3.3$$

6)

i)

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

~~$$2x^2 + 3x + 8x + 12 = 0$$~~

$$2x^2 + 8x + 3x + 12 = 0$$

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

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

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

$$2x = -3$$

$$x = -\frac{3}{2} \quad (1)$$

$$\frac{24}{1 \times 24}$$

$$2 \times 12$$

$$8 \times 3$$

4
✓

ii)

$$x^2 - 28 = 3x$$

$$x^2 - 3x - 28 = 0 \quad (1)$$

~~$$(x-7)(x+4)$$~~

$$x^2 + 4x - 7x - 28 = 0$$

~~$$(x+4)(x-7)$$~~

~~$$x = -4 \quad x = 7$$~~

$$x(x+4) - 7(x+4) = 0 \quad (2)$$

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

$$-7x = 0 \quad x = -4 \quad (1)$$

$$x = 7 \quad (1)$$

$$\frac{28}{1 \times 28}$$

$$2 \times 14$$

$$4 \times 7$$

5
✓

iii)

$$-4 = -x - 3x^2$$

$$3x^2 + x - 4 = 0 \quad (1)$$

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

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

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

$$(3x+4)(x-1) = 0 \quad (2)$$

$$3x+4 \quad x=1$$

$$3x = -4 \quad (1)$$

$$x = -\frac{4}{3} \quad (1)$$

$$x = 1.3$$

$$\frac{12}{1 \times 12}$$

$$2 \times 6$$

$$3 \times 4$$

5
✓

d)

$$i) 5T^2 + 16T + 3$$

$$5T^2 + 15T + T + 3$$

$$5T(T+3) + (T+3)$$

$$(T+3)(5T+1) \quad \checkmark \quad \textcircled{1}$$

$$\frac{15}{1 \times 15}$$

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

$$U(U) - 4F(F) \quad \times$$

$$(U-4F) \quad \text{~~(U-F)~~ (U+F)} \quad \times$$

$$iii) xy - xr + ty - tr$$

$$x(y-r) + t(y-r) \quad \checkmark \quad \textcircled{1}$$

$$\text{~~(x+t)}~~$$

$$(x+t)(y-r) \quad \checkmark \quad \textcircled{1}$$

$$e) x = 2$$

$$x = -3$$

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

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

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

$$\text{~~W~~ } x^2 + x - 6 = 0 \quad \textcircled{1}$$

1
✓0
✓2
✓2
✓

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

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

3/4 ✓

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

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

$$\frac{dy}{dx} = 4(2x+3)$$

3/4 ✓

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

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

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

0/4 ✓

iv) $y = \sin 2x - 3 \cos 4x - \tan \frac{x}{2}$

$$y = \sin 2x - 3 \cos 4x - \tan \frac{x}{2}$$

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

2/4 ✓

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

$$U = \sin 5x$$

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

$$\frac{dU}{dx} = 5 \cos 5x$$

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

$$\frac{dy}{dx} = \frac{V \frac{dU}{dx} - U \frac{dV}{dx}}{V^2}$$

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

5/4 ✓

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

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

$$\frac{dy}{dx} = -18x^{-\frac{1}{2}} + 2x^{-\frac{1}{2}}$$

0/4 ✓

vii) $y = \frac{3x^2}{\ln x}$ $y = 3x^2 \ln x$

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

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

$$U = \ln x$$

$$V = 3x^2$$

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

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

3/4 ✓

b) $4x^2 + 3x - 5$

$$\frac{dy}{dx} = 8x + 3 \quad \checkmark \text{ ①}$$

$$\frac{d^2y}{dx^2} = 8 \quad \checkmark \text{ ①}$$

$$\therefore 3(8) + 2(8x + 3) - 30 - 16x = 0 \quad \checkmark \text{ ①}$$

3/1 ✓

c) $y = \sin 2x$

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

$$\frac{d^2y}{dx^2} = -4\sin 2x \quad \checkmark \text{ ①}$$

$$\frac{d^3y}{dx^3} = -8\cos 2x \quad \checkmark \text{ ①}$$

$$\frac{d^4y}{dx^4} = 16\sin 2x \quad \checkmark \text{ ①}$$

3/1 ✓

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

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

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

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

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

6/1 ✓

$$\frac{d^2z}{dydx} = 15x^2y^4 + 8x^3 \quad \checkmark \text{ ①}$$

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

e) ~~$y = 5x + 1$~~ ~~$y = 5x - 1$~~

$$(5x - 1)(2x^2 - 2x + 5) \quad \checkmark \text{ ①}$$

?

2/1 ✓