



Complete, fold and seal
(see note 2 below)

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.

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FORENAME(S): Samih

1	Student Number	ALT19842514
2	Title of Examination Paper	Math test 1
3	Module Code	GOAC4006
4	Date and Time of Examination	18/01/2019 12:00 PM
5	Examination Venue	Hall Gower College
6	Seat Number	1
7	Number of Answer Books handed in	

List the numbers of the questions you have attempted	Office Use
Q1	
a	2
b	16
c	7
d	10
e	4
Q2	
a	21
b	4
c	1
d	6
e	4
Total	75/80

93.75%

Question one

$$(a) \quad 4x = \left(\frac{v+v_0}{2} \right) t$$

$$(v+v_0)t = 2 \Delta x \quad \checkmark \quad (1)$$

$$vt + v_0 t = 2 \Delta x \quad \checkmark$$

$$v_0 t = 2 \Delta x - vt$$

$$v_0 = \frac{(2 \Delta x - vt)}{t} \quad \checkmark$$

$$\text{when } \Delta x = 500 \quad t = 10 \quad v = 30 \quad (1)$$

then

$$v_0 = \frac{1000 - (30)(10)}{10} = \frac{1000 - 300}{10} = 70 \quad \checkmark$$

70.0 1dp

(b)

$$(i) \quad \frac{5x-2}{3} = \frac{7x+6}{2}$$

$$3(7x+6) = 2(5x-2) \quad \checkmark \quad (1)$$

$$21x + 18 = 10x - 4$$

$$21x - 10x = -4 - 18 \quad \checkmark \quad (1)$$

$$11x = -22$$

$$x = \frac{-22}{11} = -2 \quad \checkmark \quad (1)$$

$$(ii) \quad \frac{x+5}{3} = \frac{x}{6} - \frac{5x-1}{12}$$

multiply all the equation by 12 $\checkmark \quad (1)$

$$12 \left(\frac{x+5}{3} \right) = \frac{12x}{6} - \frac{12(5x-1)}{12} \quad \checkmark \quad (1)$$

$$4(x+5) = 2x - (5x-1)$$

$$4x + 20 = 2x - 5x + 1 \quad \checkmark \quad (1)$$

$$2x - 5x - 4x = 20 - 1$$

$$-7x = 19$$

$$x = -19/-7 \quad \checkmark \quad (1)$$

2

3

4

$$(iii) 2 \ln(2x+3) = \ln(x+3) + \ln(x+2)$$

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

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

$$4x^2 + 12x + 9 = x^2 + 2x + 3x + 6 \quad \checkmark \textcircled{1}$$

$$4x^2 - x^2 + 12x - 2x - 3x + 9 - 6 = 0 \quad \textcircled{1}$$

$$3x^2 + 7x + 3 = 0 \quad \checkmark$$

5×3

to find x will use the quadratic formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$a = 3 \quad b = 7 \quad c = 3 \quad \checkmark$$

$$x = \frac{-7 \pm \sqrt{49 - (4)(3)(3)}}{6} \quad \checkmark$$

$$x = \frac{-7 \pm \sqrt{13}}{6} \quad \Rightarrow -7 \div 6$$

$$x = \frac{-7 + \sqrt{13}}{6} = -0.56 \quad \checkmark$$

$$x = \frac{-7 - \sqrt{13}}{6} = -1.76 \quad \textcircled{1}$$

$$(iv) 5^x \cdot 8 = 3^{x+4}$$

$$\log 5^x \cdot 8 = \log 3^{x+4} \quad \textcircled{1}$$

$$x \log 5 + \log 8 = (x+4) \log 3 \quad \checkmark \textcircled{1}$$

$$x(0.7) + 0.9 = (x+4)(0.47) \quad \checkmark$$

$$0.7x + 0.9 = 0.47x + 1.88 \quad \textcircled{1}$$

$$0.7x - 0.47x = 1.88 - 0.9$$

$$0.23x = 0.98$$

$$x = \frac{0.98}{0.23} = 4.26 \quad \checkmark \textcircled{1}$$

(c)

(i) $8z^2 - 5z - 3$

$8z^2 - 8z + 3z - 3$

$8z(z-1) + 3(z-1)$

$(8z+3)(z-1)$

$8 \neq 3$

$4 \times 2 \times 3$

$2 \times 2 \times 2 \times 3$

(ii) $9x^2 - 49y^2$

$(3x-7y)(3x+7y)$

(iii) $xt - xr + yt - yr$

$x(t-r) + y(t-r)$

$(x+y)(t-r)$

(d)

(i) $3x^2 - 5x = 2$

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

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

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

$(3x+1)(x-2) = 0$

if $3x+1 = 0$

$3x = -1$

so $x = -\frac{1}{3}$

if $x-2 = 0$

$x = 2$

(ii) $x^2 + 5x + 6 = 0$

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

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

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

when $x+2 = 0$

$x = -2$

when $x+3 = 0$

$x = -3$

2

2

3

3

3

$$(iii) x^2 - 81 = 0$$

$$(x-9)(x+9) = 0$$

$$\text{if } x-9 = 0 \quad \text{so } x = 9 \quad \textcircled{1} \checkmark$$

$$\text{if } x+9 = 0 \quad \text{so } x = -9 \quad \textcircled{1} \checkmark$$

$$(iv) 4x^2 + 9x + 5 = 0$$

$$4x^2 + 4x + 5x + 5 = 0$$

$$4x(x+1) + 5(x+1) = 0$$

$$(4x+5)(x+1) = 0 \quad \textcircled{1}$$

$$\text{if } 4x+5 = 0 \quad \text{so } x = \frac{-5}{4} \quad \checkmark$$

$$\text{if } x+1 = 0 \quad \text{so } x = -1 \quad \textcircled{1} \checkmark$$

$$(e) (3x+1)(2x-1) - (x+2)^2 = 5$$

$$6x^2 - 3x + 2x - 1 - [x^2 + 4x + 4] = 5$$

$$6x^2 - 3x + 2x - 1 - x^2 - 4x - 4 = 5 \quad \checkmark \quad \textcircled{1}$$

$$5x^2 - 5x - 5 = 5$$

$$5x^2 - 5x - 5 - 5 = 0 \quad \checkmark \quad \textcircled{1}$$

$$5x^2 - 5x - 10 = 0 \quad \checkmark$$

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

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

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

$$\text{if } 5x+5 = 0 \quad \text{so } x = -\frac{5}{5} = -1 \quad \checkmark \quad \textcircled{1}$$

$$\text{if } x-2 = 0 \quad \text{so } x = 2 \quad \checkmark \quad \textcircled{1}$$

Question three

(a)

(i) $y = 8x^3 - 2x^2 + 5x - 1$

$$\frac{dy}{dx} = 24x^2 - 4x + 5$$

30

(ii) $y = 3(2x+1)^2$

$$\frac{dy}{dx} = 6(2x+1)(2)$$

$$= 12(2x+1)$$

$$24x + 24$$

30

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

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

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

$$= \frac{1}{3\sqrt[3]{x^2}} - \frac{2}{x^2}$$

30

(iv) $y = 4\sin 3x + 2\cos x + \tan x$

$$\frac{dy}{dx} = 12\cos 3x - 2\sin x + \sec^2 x$$

30

(v) $y = 2x^5 \tan x$

$$u = 2x^5$$

$$v = \tan x$$

$$\frac{du}{dx} = 10x^4$$

$$\frac{dv}{dx} = \sec^2 x$$

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

$$\frac{dy}{dx} = 2x^5 (\sec^2 x) + \tan x (10x^4)$$

$$= 2x^5 \sec^2 x + 10x^4 \tan x$$

4

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

$$u = 5 \sin 2x$$

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

$$\frac{du}{dx} = 10 \cos 2x$$

$$\frac{dv}{dx} = 3e^{3x}$$

$$\frac{dy}{dx} = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2}$$

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

3

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

$$= \frac{10 \cos 2x}{e^{3x}} - \frac{15 \sin 2x}{e^{3x}}$$

$$(vii) y = \sqrt{5x^6 - 2x + 1}$$

$$y = (5x^6 - 2x + 1)^{\frac{1}{2}}$$

$$\frac{dy}{dx} = \frac{1}{2} (5x^6 - 2x + 1)^{-0.5} (30x^5 - 2)$$

$$\frac{15x^5 - 1}{\sqrt{5x^6 - 2x + 1}}$$

26

⑥ $y = \sin 3x$

$\frac{dy}{dx} = 3 \cos 3x$ ✓ ①

$f'' = -9 \sin 3x$ ✓ ①

$f''' = -27 \cos 3x$ ✓ ①

$f'''' = 81 \sin 3x$ ✓ ①

⑦ $y = 4x^2 + 5$

$\frac{dy}{dx} = 8x$ ✓ ① $\frac{d^2y}{dx^2} = 8$ ✓

~~$2\left(\frac{d^2y}{dx^2}\right) + 3\left(\frac{dy}{dx}\right) - 2$~~

~~$2(8x) + 3(8) - 2$~~

~~$16x + 24 - 2$~~

~~$16x + 22$~~

$2\left(\frac{d^2y}{dx^2}\right) + 3\left(\frac{dy}{dx}\right) - 2 = ?$

$2(8) + 3(8x) - 2 = ?$

$16 + 24x - 2 = ?$

$14 + 24x$

⑧ $y = -4x + 1$

$y = x^2 + 6x + 10$

$x^2 + 6x + 10 = -4x + 1$

$x^2 + 6x + 4x + 10 - 1 = 0$

$x^2 + 10x + 9 = 0$ ✓ ①

4

1

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

$$x^2 + 9x + x + 9 = 0$$

$$x(x+9) + (x+9) = 0$$

$$(x+1)(x+9) = 0 \quad \checkmark \textcircled{1}$$

$$\text{if } x+1 = 0$$

$$x = -1 \quad \checkmark \textcircled{1}$$

$$\text{if } x+9 = 0$$

$$x = -9 \quad \checkmark \textcircled{1}$$

$$\text{As } y = -4x + 1$$

Substitute x as (-1)

$$y = -4(-1) + 1$$

$$y = 4 + 1$$

$$= 5$$

$\checkmark \textcircled{1}$

Substitute x as -9

$$y = -4x + 1$$

$$y = -4(-9) + 1$$

$$= 36 + 1$$

$$= 37$$

$\checkmark \textcircled{1}$

$$\textcircled{e} \quad z = x^5 + 2x^2y^3 - y^7$$

$$\frac{\partial z}{\partial x} = 5x^4 + 4xy^3 \quad \checkmark \textcircled{1}$$

$$\frac{\partial^2 z}{\partial x^2} = 20x^3 + 4y^3 \quad \checkmark \textcircled{1}$$

$$\frac{\partial^2 z}{\partial x \partial y} = 3y^2(4x)$$

$$= 12xy^2$$

$$\frac{\partial z}{\partial y} = 3y^2(2x^2) - 7y^6 \quad \checkmark \quad \textcircled{1}$$

$$\frac{\partial^2 z}{\partial y^2} = 6y(2x^2) - 42y^5 \quad \checkmark \quad \textcircled{1}$$

$$\begin{aligned} \frac{\partial^2 z}{\partial y \partial x} &= 4x(3y^2) \quad \checkmark \\ &= \underline{\underline{12xy^2}} \end{aligned}$$