

Complete, fold and seal

(see note 2 below)

SURNAME: BREWIS

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.**

1	Student Number	1503509
2	Title of Examination Paper	~~XXXXXXXXXX~~ MATHS TEST 2 ~~XXXXXXXXXX~~
3	Module Code	M4X00391
4	Date and Time of Examination	10-01-2018 1400
5	Examination Venue	HILL HOUSE GOVER IT2 COLLEGE
6	Seat Number	11
7	Number of Answer Books handed in	ONE

List the numbers of the questions you have attempted	Office Use
ONE	
THREE	
Q1 a	12
b	0
c	14
d	3
e	1
Q3 a	11
b	3
c	0
d	4
e	2
Office Use	50/80

Test 1

✓
✓
✓
✓
✓

✓
✓
✓
✓
✓

62.5%

✓ 62.5%

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

cross multiply

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

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

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

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

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

$$x = \underline{\underline{-1.5}} \quad (1)$$

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

multiply by 12

$$2 \cancel{12} (x+2) - 4 \cancel{12} (2x+3) = \frac{x}{\cancel{12}} \times 12$$

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

$$2x + 4 - 8x - 12 = x \quad \checkmark \quad (1)$$

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

$$-8 = 6x \quad \checkmark$$

$$-\frac{8}{6} = x \quad \checkmark$$

$$\underline{\underline{-1.3}} = x$$

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

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

$$\checkmark \log 2^{x+1} = \log [5^x + 3] \quad \times$$

$$\checkmark (x+1) \log 2 = (3) \log 5 + \log 3$$

$$(x+1) \cdot 0.301 = (3) 0.6989 + 0.4771$$

$$0.301x + 0.301 = 2.0967 + 0.4771$$

$$\checkmark 0.301x = 2.0967 + 0.4771 - 0.301$$

$$0.301x = 2.2728$$

$$\checkmark x = \frac{2.2728}{0.301}$$

$$x = 7.5508$$

$$\checkmark x = \underline{\underline{7.6}}$$

a, (iv)

$$\begin{aligned}
 \log_a (x+3) + \log_a (2x+1) &= 2 \log_a (3x-1) \\
 \log_a [(x+3) \cdot (2x+1)] &= \log_a (3x-1)^2 \quad \text{①} \\
 (x+3)(2x+1) &= (3x-1)(3x-1) \quad \text{②} \\
 2x^2 + x + 6x + 3 &= 9x^2 - 3x - 3x + 1 \quad \text{③} \\
 &= 9x^2 - 2x^2 - 3x - 3x - x - 6x + 1 - 3 \quad \text{④} \\
 &= 7x^2 - 13x - 2 \quad \text{⑤}
 \end{aligned}$$

$$\begin{pmatrix} 7x + 1 \\ 7x + 1 \end{pmatrix} \begin{pmatrix} 7x - 14 \\ x - 2 \end{pmatrix}$$

$$7x + 1 = 0$$

$$7x = -1$$

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

$$x = -0.14$$

$$x - 2 = 0$$

$$x = 2$$

$$7x - 2 =$$

$$\text{Find } -13$$

$$1 \times 4 =$$

$$2 \times 6 =$$

$$(7x - 14)$$

(i) $2x^2 + 11x + 12 = 0$

$$\begin{pmatrix} 2x+3 \end{pmatrix} \begin{pmatrix} 2x+8 \end{pmatrix}$$

$$\begin{pmatrix} 2x+3 \end{pmatrix} \begin{pmatrix} x+4 \end{pmatrix} \quad (2)$$

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

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

$$x=-\frac{3}{2} \quad x=-4$$

$$x=-1.5 \quad x=-4$$

WORKINGS
24 Find 11

~~1x24~~
~~2x12~~
✓ $3 \times 8 \quad 3+8=11$

Foil: $(2x+3)(x+4)$
 $2x^2 + 8x + 3x + 12$
 $2x^2 + 11x + 12$ ✓

ANS: $x=-1.5$ ✓ $x=-4$ ✓

(ii) $x^2 - 28 = 3x$

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

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

$$x+4=0 \quad x-7=0$$

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

WORKINGS

-28 Find 3

1×28
 2×14
 $4 \times 7 \quad -7+4=-3$

Foil: $(x+4)(x-7)$
 $x^2 - 7x + 4x - 28$
 $x^2 - 3x - 28$ ✓

ANS: $x=-4$ ✓ $x=7$ ✓

(iii) $-4 = -x - 3x^2$

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

$$(3x-3)(3x+4) \quad (2)$$

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

$$x-1=0 \quad 3x+4=0$$

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

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

$$x=-1.3$$

WORKINGS

-12 Find 1

1×12
 2×6
 $3 \times 4 \quad +4-3$

Foil: $(3x-1)(3x+4)$
 $3x^2 + 4x - 3x - 4$
 $3x^2 + x - 4$ ✓

ANS: $x=1$ ✓ $x=-1.3$ ✓

(2)

d, (i) $5T^2 + 16T + 3$
 $(5T + 1)(T + 3)$ ✓

$5T + 1 = 0$ $T + 3 = 0$
 $5T = -1$ $T = -3$
 $T = -\frac{1}{5}$
 $T = -0.2$

ANS: $T = -0.2$ $T = -3$

no need

no need

WORKINGS

15 Find 16

✓ 1x15 $1+15=16$

3x5

$(5T + 1)(T + 3)$

Foil:

$5T^2 + 15T + T + 3$ ✓

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

ANS: $(U + 4F)(U - 4F)$ ✗

WORKINGS

$(U \times U) = U^2$ ✓

$(U + 4F)(U - 4F)$

$U^2 - \cancel{4F} + \cancel{4F} + 4F^2$
 $U^2 - 4F^2$ ✓

(iii) $xy - xr + ty - tr$
 $x(y - r) + t(y - r)$ ✓

ANS: $(x + t)(y - r)$ ✓ (2)

e,

$x = 2$

$x = -3$

$(x - 2)(x + 3) = 0$ ✓

Foil

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

ANS: $x^2 + x - 6 = 0$ ✓

9/

$$(i) \quad y = 5x^4 + 3x^2 - x + 1$$

$$\frac{dy}{dx} = 5 \cdot 4x^{4-1} + 3 \cdot 2x^{2-1} - x^{-1} + 1 \leftarrow \text{WORKINGS}$$

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

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

$$\frac{dy}{dx} = 2(2x+3)^{2-1} \cdot (2) \quad \text{①}$$

$$\text{ANS: } \frac{dy}{dx} = 4(2x+3) \quad \text{②}$$

$$(iii) \quad y = x\sqrt{x} + 3\sqrt{x}$$

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

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

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

Quotient Rule

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

$$u = \sin 5x$$

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

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

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

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

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

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

Chain Rule.

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

$$\frac{dy}{dx} = \frac{1}{2} (6x^3 - 2x + 1)^{-\frac{1}{2}} \cdot (18x^2 - 2)$$

2/11

✓

(vii) $y = 3x^2 \ln x$

Product Rule

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

$$u = 3x^2$$

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

$$v = \ln x$$

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

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

3/11

✓

b,

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

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

First

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

Second

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

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

?

3/11

✓

c, $y = \sin 2x$

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

$$\frac{d^2y}{dx^2} = -\sin 2x \quad \times$$

$$\frac{d^3y}{dx^3} = -\cos 2x \quad \times$$

$$\frac{d^4y}{dx^4} = \sin 2x \quad \times$$

0/1 ✓

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

$$\frac{\partial z}{\partial x} = 3x^2y^5 + 8x^3y + 6x \quad \checkmark \quad \textcircled{1}$$

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

$$\frac{\partial z}{\partial y} = 5x^3y^4 + 2x^4 - 6y^2 \quad \times$$

$$\frac{\partial^2 z}{\partial y^2} = 20x^3y^3 - 12y \quad \times$$

$$\frac{\partial^2 z}{\partial x \partial y} = 15x^2y^4 + 8x^3 \quad \checkmark \quad \textcircled{1}$$

$$\frac{\partial^2 z}{\partial y \partial x} = 15x^2y^4 + 8x^3 \quad \checkmark \quad \textcircled{1}$$

4 ✓

e1

$$y = 5x - 1$$

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

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

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

$$2x^2 - 7x + 6 = 0$$

$$\textcircled{1} \quad \left\{ \begin{array}{l} 2x - 3 \\ 2x - 3 \end{array} \right\} \quad \left\{ \begin{array}{l} 2x - 4 \\ x - 2 \end{array} \right\}$$

$$2x - 3 = 0$$

$$2x = -3$$

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

$$x = -1.5$$

$$x - 2 = 0$$

$$x = 2$$

$$x = -2$$

$$x = -2$$

$$x = -2$$

Substitute into $y = 5x - 1$

$$5x - 1$$

$$5(-1.5) - 1$$

$$x = -8.5$$

$$5x - 1$$

$$5(-2) - 1$$

$$x = -11$$

~~x~~

~~x~~

~~-1.5~~

x

y

ANS

-1.5 8.5

-2, -11

working 5

$$\begin{array}{r} 12 \\ 18 \times 2 \\ 36 \\ \hline 3 \times 4 = 12 \\ 3 \times 4 = 12 \\ \hline 12 \end{array}$$

$$(2x - 3)(x - 2)$$

$$(2x - 3)(x - 2)$$

Foil

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

$$2x^2 - 7x + 6$$