

12 Pages

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:

Davey

FORENAME(S):

Cameron Lloyd

1	Student Number	DAVID 1809213/1
2	Title of Examination Paper	Mathematics Test 2
3	Module Code	M4X00391
4	Date and Time of Examination	10/5/2019 PM
5	Examination Venue	Hall
6	Seat Number	30
7	Number of Answer Books handed in	1

List the numbers of the questions you have attempted	Office Use
Q2	
a	12
b	10
c	9
d	1
e	5
Q3	
a	20
b	5
c	3
d	7
Total	72/80

(Gweler yr ochr arall am y fersiwn Cymraeg)

Q2)a)

$$i) (2+3j) + (5-2j) \checkmark$$

$$= 7+j \checkmark \textcircled{1}$$

$$ii) (2+3j) - (4+j) \checkmark \textcircled{1}$$

$$= -2+2j \checkmark \textcircled{1}$$

$$iii) \frac{2+3j}{5-2j}$$

$$= \frac{2+3j}{5-2j} \times \frac{5+2j}{5+2j} \checkmark \textcircled{1}$$

$$= \frac{10+4j+15j+6j^2}{25+10j-10j-4j^2} \checkmark \textcircled{1}$$

$$= \frac{10+19j-6}{25+4}$$

$$= \frac{4+19j}{29} \checkmark \textcircled{1}$$

$$= \frac{4}{29} + \frac{19}{29}j \checkmark \textcircled{1}$$

$$iv) (2-3j) + (4-j)$$

$$6-4j \checkmark \textcircled{1}$$

$$v) (2+3j)^2 + (5-2j) + (4+j)$$

$$(2+3j)(2+3j)$$

$$4 + 6j + 6j + 9j^2 \quad \checkmark \textcircled{1}$$

$$4 + 12j - 9$$

$$(-5 + 12j) + (5 - 2j) \quad \checkmark \textcircled{1}$$

$$(0 + 10j) + (4 + j)$$

$$= 4 + 11j \quad \checkmark \textcircled{1}$$

Q2) b)

$$14x^2 = -3x - 9$$

$$14x^2 + 3x + 9 = 0 \quad \checkmark \textcircled{1}$$

A B c

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

$$\frac{-3 \pm \sqrt{3^2 - 4 \times 14 \times 9}}{28} \quad \checkmark \textcircled{1}$$

$$\frac{-3 \pm \sqrt{-495}}{28} \quad \checkmark \textcircled{1}$$

$$\frac{-3 \pm \sqrt{495} \sqrt{-1}}{28} \quad \checkmark$$

$$\frac{-3 \pm 22.25j}{28} \quad \checkmark \textcircled{1}$$

$$\frac{-3}{28} + \frac{22.25}{28}j \quad \checkmark$$

$$x = -0.11 + 0.79j$$

$$r = \sqrt{0.11^2 + 0.79^2}$$

$$= 0.8$$

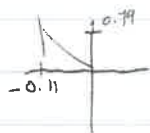
$$= \tan^{-1} \left(\frac{0.79}{0.11} \right)$$

$$= 82.07^\circ$$

$$= 180 - 82.07$$

$$= 97.93^\circ$$

$$= 0.8 (\cos 97.93^\circ + j \sin 97.93^\circ)$$



$$x = -0.11 - 0.79j$$

$$r = 0.8$$

$$\tan^{-1} = 82.07$$

$$= 180 + 82.07$$

$$= 262.07^\circ$$

$$= 0.8 (\cos 262.07^\circ + j \sin 262.07^\circ)$$

Q2)c)

$$i) (6 + 5j)^5$$

$$r = \sqrt{6^2 + 5^2}$$

$$= \sqrt{61}$$

$$= 7.81$$

$$= \tan^{-1} \left(\frac{5}{6} \right)$$

$$= 50.19^\circ$$

$$= 7.81^6 (\cos 6 \times 50.19^\circ + j \sin 6 \times 50.19^\circ)$$

$$= 226937.47 (\cos 301.14^\circ + j \sin 301.14^\circ)$$

$$= 117356.4 - j 194237.2$$

$$= 117356.4 - j 194237.2$$

$$= 7.81^5 (\cos 5 \times 50.19^\circ + j \sin 5 \times 50.19^\circ)$$

$$= 29057.29 (\cos 250.95^\circ + j \sin 250.95^\circ)$$

$$= 29057.29 (\cos 250.95^\circ + j \sin 250.95^\circ)$$

$$= -9484.1 - j 27465.94$$

For correct method

For correct method

311

$$\text{ii) } (-2+3j)^7$$

$$r = \sqrt{2^2+3^2}$$

$$= \sqrt{13}$$

$$= 3.61$$

$$\theta = \tan^{-1}\left(\frac{3}{2}\right)$$

$$= 56.31^\circ$$

$$= 180 - 56.31$$

$$= 123.69^\circ$$

$$= 3.61^7 (\cos 7 \times 123.69^\circ + j \sin 7 \times 123.69^\circ)$$

$$= 7990.1 (\cos 865.83^\circ + j \sin 865.83^\circ)$$

$$= -6610.81 + j 4375.31$$

$$= -6610.81 + j 4487.64$$

Q2) d)

$$1+8j$$

$$= 1-8j$$

Q2) e) $(6+j)(2-5j)(1-j)$

$$(6+j)(2-5j)$$

$$12 - 30j + 2j - 5j^2$$

$$12 - 28j + 5$$

$$(17-28j)(1-j)$$

$$17 - 17j - 28j + 28j^2$$

$$17 - 45j - 28$$

$$-11 - 45j$$

$$= 11 - 45j$$

$$r = \sqrt{11^2 + 45^2}$$

$$= 46.32$$

$$= \tan^{-1}\left(\frac{45}{11}\right) \checkmark$$

$$= 76.26$$

①

$$= 180 + 76.26$$

$$= 256.26^\circ \checkmark$$

$$= 46.32 (\cos 256.26^\circ + j \sin 256.26^\circ) \checkmark \text{ ①}$$

Q3) a)

$$i) \begin{pmatrix} -5 & 16 & 7 \\ 34 & -19 & 26 \\ -3 & 3 & 3 \end{pmatrix}$$

$$ii) \begin{pmatrix} 23 & 2 & 19 \\ -21 & -27 & 25 \\ -7 & 8 & -17 \end{pmatrix}$$

$$iii) \begin{pmatrix} 38 & 28 \\ 60 & 59 \\ 10 & 7 \end{pmatrix}$$

iv) Cannot calculate CA ✓ ①

$$v) |A| = \begin{vmatrix} 5 & -1 & 6 \\ 7 & 5 & -1 \\ 1 & 0 & 2 \end{vmatrix} = \begin{vmatrix} 5 & -1 \\ 7 & 5 \\ 1 & 0 \end{vmatrix} \quad \text{①}$$

$$= 51 - 16$$

$$|A| = 35 \quad \text{①}$$

$$vi) |B| = \begin{vmatrix} 3 & 1 & 1 \\ 2 & -5 & 4 \\ -3 & 1 & 1 \end{vmatrix} = \begin{vmatrix} 3 & 1 \\ 2 & -5 \\ -3 & 1 \end{vmatrix} \quad \text{①}$$

$$= -25 - 29$$

$$= -54 \quad \text{①}$$

vii) $\begin{pmatrix} 8 & 0 & 7 \\ 9 & 0 & 3 \\ -2 & 1 & 3 \end{pmatrix}$

viii) Cannot calculate $A+D$

Q3)b) $9x^2 + 3x = 7$
 $9x^2 + 3x - 7 = 0$
 A B C

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

$$\frac{-3 \pm \sqrt{3^2 - 4 \times 9 \times -7}}{18}$$

$$\frac{-3 \pm \sqrt{261}}{18}$$

$$x = 0.73 \text{ or } x = -1.06$$

Q3)c) $\begin{array}{ccc|ccc} x & 3 & -4 & x & 3 & \\ 4 & 4 & 2 & 4 & 4 & \\ -2 & 5 & (x+2) & -2 & 5 & \end{array}$

$$4x(x+2) - 12 - 80$$

$$4x^2 + 8x - 92$$

$$32 + 10x + 12(x+2)$$

$$32 + 10x$$

$$32 + 10x + 12x + 24$$

$$56 + 22x \quad \checkmark$$

$$4x^2 + 8x - 92 - 56 + 22x$$

$$4x^2 + 30x - 148$$

A

B

C

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

$$\frac{-30 \pm \sqrt{30^2 - 4 \times 4 \times -148}}{8}$$

$$x = -0.36 \text{ or } x = -7.14 \quad \times$$

Q3)d)

$$\begin{pmatrix} 5 & 3 & 1 \\ 3 & -2 & 3 \\ 2 & 1 & -5 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 25 \\ 26 \\ -6 \end{pmatrix}$$

$$|A| = \begin{vmatrix} 5 & 3 & 1 \\ 3 & -2 & 3 \\ 2 & 1 & -5 \end{vmatrix} = \begin{vmatrix} 5 & 3 \\ 3 & -2 \\ 2 & 1 \end{vmatrix}$$

$$= 71 - -34$$

$$= 105 \quad \checkmark \quad \textcircled{1}$$

$$|x| = \begin{vmatrix} 25 & 3 & 1 \\ 26 & -2 & 3 \\ -6 & 1 & -5 \end{vmatrix} = \begin{vmatrix} 25 & 3 \\ 26 & -2 \\ -6 & 1 \end{vmatrix}$$

$$= 222 - 693$$

$$= -471$$

$$= 222 - -303$$

$$= 525 \quad \checkmark \quad \textcircled{1}$$

$$|y| = \begin{array}{ccc|ccc} 5 & 25 & 1 & 5 & 25 & \\ 3 & 26 & 3 & 3 & 26 & \\ 2 & -6 & -5 & 2 & -6 & \end{array}$$

$$= -518 - -413$$

$$= -105 \checkmark \textcircled{1}$$

$$|z| = \begin{array}{ccc|ccc} 5 & 3 & 25 & 5 & 3 & \\ 3 & -2 & 26 & 3 & -2 & \\ 2 & 1 & -6 & 2 & 1 & \end{array}$$

$$= 291 - 24$$

$$= 315 \checkmark \textcircled{1}$$

$$x = \frac{525}{105}$$

$$= 5 \checkmark \textcircled{1}$$

$$y = \frac{-105}{105}$$

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

$$z = \frac{315}{105}$$

$$= 3 \checkmark \textcircled{1}$$