



Complete, fold and seal
(see note 2 below)

SURNAME: Griffins

FORENAME(S): Ewan Tomos

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.**

[illegible]

(Gweler yr ochr arall am y fersiwn Cymraeg)

SECTION A

$$1 \quad 15(3x+2) - 8(2-4x) = 125$$

$$45x + 30 - 16 + 32x = 125$$

$$77x + 14 = 125$$

$$77x + 14 - 125 = 0$$

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

$$x = \frac{-14 \pm \sqrt{(14)^2 - 4(77)(-125)}}{2(77)}$$

$$\therefore x = 1.19 \quad \text{or} \quad x = -1.37$$

$$2 \quad A = \begin{pmatrix} 3 & -1 \\ 5 & 1 \end{pmatrix} \quad B = \begin{pmatrix} 2 & -3 \\ 2 & 1 \end{pmatrix} \quad C = \begin{pmatrix} 4 & -3 & 2 \\ 2 & 3 & 4 \end{pmatrix}$$

$$i) \quad 4A - 3B = \begin{pmatrix} 12 & -4 \\ 20 & 4 \end{pmatrix} - \begin{pmatrix} -6 & 9 \\ -6 & -3 \end{pmatrix}$$

$$= \begin{pmatrix} 18 & 5 \\ 26 & 7 \end{pmatrix}$$

$$ii) \quad BC = \begin{pmatrix} 2 & -3 \\ 2 & 1 \end{pmatrix} \times \begin{pmatrix} 4 & -3 & 2 \\ 2 & 3 & 4 \end{pmatrix}$$

$$= \begin{pmatrix} 2 & -15 & -8 \\ 10 & -3 & 8 \end{pmatrix}$$

$$c_{11} = (2 \times 4) + (-3 \times 2) = 2$$

$$c_{21} = (2 \times 4) + (1 \times 2) = 10$$

$$c_{12} = (2 \times -3) + (-3 \times 3) = -15$$

$$c_{22} = (2 \times -3) + (1 \times 3) = -3$$

$$c_{13} = (2 \times 2) + (-3 \times 4) = -8$$

$$c_{23} = (2 \times 2) + (1 \times 4) = 8$$

iii)



$$4 \quad Z_1 = 5 - j4 \quad Z_2 = 3 + j5$$

$$Z_1 = \sqrt{5^2 + 4^2}$$

$$= 6.4$$

$$\theta = \tan^{-1} \frac{4}{5}$$

$$= \cancel{39.4}$$

$$-39^\circ$$

$$\therefore Z_1 = 6.4 \angle -39^\circ \quad \checkmark$$

$$Z_2 = \sqrt{3^2 + 5^2}$$

$$= 5.8$$

$$\theta = \tan^{-1} \frac{5}{3}$$

$$= \cancel{59.4}$$

$$59^\circ$$

$$\therefore Z_2 = 5.8 \angle 59^\circ \quad \checkmark$$

$$i) \quad Z_1 Z_2 = (6.4)(5.8) \angle (-39) + (59)$$

$$= 37.12 \angle 20^\circ \quad \checkmark$$

$$ii) \quad \frac{Z_1}{Z_2} = \frac{6.4}{5.8} \angle -39 - 59$$

$$= 1.1 \angle -98^\circ \quad \checkmark$$

10.

$$5 \quad \int_0^{\pi/2} (4 \cos 2x - 6 \sin 3x) dx$$

$$\left[\frac{-4}{2} \sin 2x - \frac{6}{3} \cos 3x \right]_0^{\pi/2} \quad \times$$

$$\left[\frac{-4}{2} \sin 2\left(\frac{\pi}{2}\right) - \frac{6}{3} \cos 3\left(\frac{\pi}{2}\right) \right] - \left[\frac{-4}{2} \sin 2(0) - \frac{6}{3} \cos 3(0) \right]$$

$$= -2.1 - -2$$

$$= -0.1 \quad \times$$

2

20
40

$$2 \int_0^3 \left(\frac{1}{(3x+5)^4} \right) dx$$

i)

Let $u = 3x+5$ and so $du = 3 dx$

1

$$ii) \frac{8}{(x+1)(x+2)} = \frac{A}{(x+1)} + \frac{B}{(x+2)}$$

$$8 = A(x+2) + B(x+1)$$

where $x = -2$

$$8 = B(-2+1)$$

$$8 = -B$$

$$\therefore B = -8$$

where $x = -1$

$$8 = A(-1+2)$$

$$8 = A$$

$$\therefore A = 8$$

$$\therefore \frac{8}{(x+1)(x+2)} = \frac{8}{(x+1)} - \frac{8}{(x+2)}$$

$$\int_1^4 \frac{8}{(x+1)(x+2)} dx = \int_1^4 \left(\frac{8}{(x+1)} - \frac{8}{(x+2)} \right) dx$$

$$= [8 \ln(x+1) - 8 \ln(x+2)]_1^4$$

$$= [8 \ln(5) - 8 \ln(6)] - [8 \ln(2) - 8 \ln(3)]$$

8

$$= 1.7851$$

$$= 1.7851$$

X

9
20

3	x	f	xf	$f(x-\bar{x})^2$
	5	24	120	1197.44
	15	42	630	5651.52
	25	58	1450	24649
	35	42	1470	8300.6
	45	22	990	952.2
	55	12	660	11723.8
		<u>200</u>	<u>5320</u>	<u>61522.36</u>

$$i) \bar{x} = \frac{\sum fx}{\sum f}$$

$$= \frac{5320}{200}$$

$$= 26.6$$

$$\sigma = \sqrt{\frac{\sum f(x-\bar{x})^2}{\sum f}}$$

$$= \sqrt{\frac{61522.36}{200}}$$

$$= 17.54$$

$$ii) A(0.45) \quad B(0.85)$$

$$a) \text{ in series A and B}$$

$$AB = 0.45 \times 0.85$$

$$= 0.38$$

$$b) \text{ in parallel}$$

$$AB \quad A\bar{B} \quad \bar{A}B$$

$$(0.38) + (0.07) + (0.46)$$

$$\therefore P = 0.91$$

$$\bar{B} = 1 - 0.85$$

$$= 0.15$$

$$\bar{A} = 1 - 0.45$$

$$= 0.55$$

12
20

4

i) a) $y = \frac{2e^{6x}}{\sin 3x}$

Let $u = \sin 3x$ and $v =$

0.

b) $y = 6\cos(3x-5)$

Let $u = 3x - 5$ So
 $\frac{du}{dx} = 3$

$y = 6\cos u$
 $\frac{dy}{du} = -6\sin u$

1

$$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$$

$$= 3 \times -6 \sin u$$

$$= -18 \sin u$$

$$= -18 \sin(3x-5)$$

$$= -27x - 45 \sin(3x-5)$$

X

$$\frac{1}{20}$$