

maths exam - ACHA4000
Shay Beer
2000890

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i) $AB = \begin{pmatrix} -18 & -4 & 9 \\ 14 & -75 & 6.5 \\ -6 & 6 & 3.5 \end{pmatrix}$

ii) $BA = \begin{pmatrix} -54.5 & 18 & 27 \\ -3 & 8 & 43 \\ 48 & -18 & -43 \end{pmatrix}$

iii) $AC = \begin{pmatrix} 29 & 124 \\ -17 & 35 \\ 8 & 39 \end{pmatrix}$

iv) $CA =$ Cannot ~~be~~ multiply

v) $|A| = 8(4-0) - 1(-10-15) + 7(-0-6)$
 $|A| = -35$

vi) $|B| = -2(5-18) + 8(2-0) + 0.5(-18-0)$
 $= -71$

vii) $A+B = \begin{pmatrix} 6 & 7 & 7.5 \\ -3 & 7 & 7 \\ 3 & -9 & 3 \end{pmatrix}$

viii) can't do

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b) $15x^2 + 4x - 17 = 90$

$$x = \frac{-4 \pm \sqrt{4^2 - 4(15)(-17)}}{2 \times 15}$$

$$x = \frac{-4 \pm \sqrt{1036}}{30}$$

$$x = \frac{-4 \pm 32.19}{30}$$

$$x = \frac{-4 + 32.19}{30}$$

$$\text{OR } x = \frac{-4 - 32.19}{30}$$

$$x = 0.94$$

$$x = -1.21$$

c) $2(3x - 0) - 4x(12 - 0) + 5(4x + 4) - 1x = 2$

$$6x - 16x - 20x - 20 + 5x$$

$$-25x - 20 = 2$$

$$-25x - 22 = 0$$

$$\div 2 \quad -12.5x - 11 = 0$$

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$$\begin{aligned} D) \quad 2x + 3y + 2z &= 14 \\ x + 2y + 5z &= 4 \\ 3x + y - 2z &= 19 \end{aligned}$$

$$\begin{pmatrix} 2 & 3 & 2 \\ 1 & 2 & 5 \\ 3 & 1 & -2 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 14 \\ 4 \\ 19 \end{pmatrix}$$

$$A_1 = 2(5 \cdot 4) - 3(-2 \cdot 15) + 2(1 \cdot 6)$$

$$\cancel{A_1 = 23} \quad | A_1 = 23$$

$$A_1 = \begin{pmatrix} 14 & 3 & 2 \\ 4 & 2 & 5 \\ 19 & 1 & -2 \end{pmatrix} \quad A_1 = 14(4 \cdot 5) - 3(-8 - 95) + 2(126 + 309 - 68)$$

$$A_1 = 115$$

$$A_2 = \begin{pmatrix} 2 & 14 & 2 \\ 1 & 4 & 5 \\ 3 & 19 & -2 \end{pmatrix} \quad A_2 = 2(-8 - 95) - 14(-2 - 5) + 2(19 \cdot 1 - 206 + 238 + 14)$$

$$A_2 = 46$$

$$A_3 = \begin{pmatrix} 2 & 3 & 14 \\ 1 & 2 & 4 \\ 3 & 1 & 19 \end{pmatrix} \quad A_3 = 2(38 - 4) - 3(19 - 12) + 14(68 - 21 - 70)$$

$$A_3 = -23$$

$$x = \frac{115}{23}$$

$$y = \frac{46}{23}$$

$$z = \frac{-23}{23}$$

$$x = 5$$

$$y = 2$$

$$z = -1$$

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2)
i) $z_1 + z_3 = -1 + 6j$

ii) $z_1 - z_3 = (3 + 7j) - (-4 - j)$
 $3 + 7j + 4 + j$
 $7 + 8j$

iii) $\frac{z_1}{z_2} = \frac{(3 + 7j)}{(2 - 10j)} \times \frac{(2 + 10j)}{(2 + 10j)}$

$$\frac{6 + 30j + 14j + 70j^2}{4 + 20j - 20j - 100j^2}$$

$$\frac{-64 + 44j}{4 + 100}$$

$$\frac{-64}{104} + \frac{44j}{104}$$

iv) $z_1 - \bar{z}_2 = (3 + 7j) - (2 + 10j)$
 $1 - 3j$

v) $(z_3)^3 - \bar{z}_1 = 6 + 64j$

$$(-4 - j)^3 - (3 - 7j)$$

$$-64 - 48j - 12j^2 - 3 + 7j$$

$$-55 - 41j$$

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$$8x^2 = -3x - 18$$
$$6) 8x^2 + 3x + 18 = 0$$

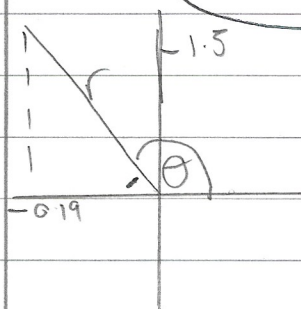
$$x = \frac{-3 \pm \sqrt{(3)^2 - 4(8)(18)}}{2(8)}$$

$$x = \frac{-3 \pm \sqrt{-567}}{16}$$

$$x = \frac{-3 \pm 23.81j}{16}$$

$$x = \frac{-3}{16} + \frac{23.81j}{16}, \quad x = \frac{-3}{16} - \frac{23.81j}{16}$$

$$x = -0.19 + 1.45j \quad x = -0.19 - 1.5j$$

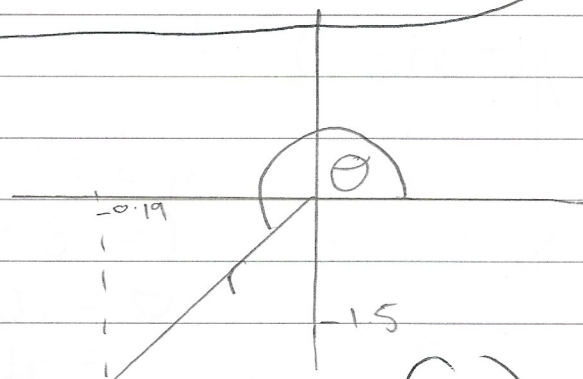


$$r = 1.5^2 + 0.19^2$$

$$r = 1.5$$

$$\theta = \tan^{-1}(1.5/0.19) = 82.8$$

$$\theta = 180 - 82.8 = 97.2^\circ$$



$$r = 1.5^2 + 0.19^2 = 1.5$$

$$\theta = 180 + 82.8$$

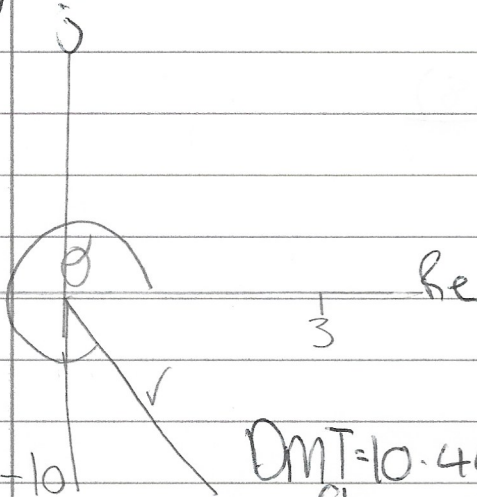
$$\theta = 262.8^\circ$$

$$1.5(\cos 97.2 + j \sin 97.2) \text{ and } 1.5(\cos 262.8 + j \sin 262.8)$$

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c) $(3 - 10j)^6$



$$r = 10^2 + 3^2$$

$$r = 10.44$$

$$\theta = 360 - 73.3$$

$$\theta = 286.7$$

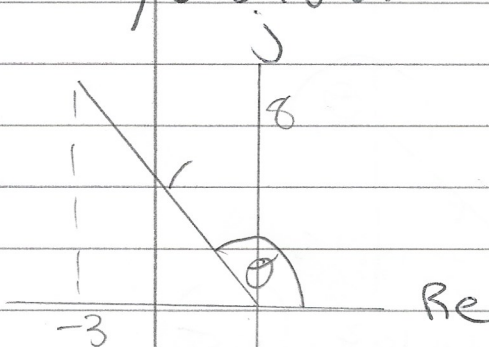
$$\text{DMT} = 10.44 (\cos 286.7 + j \sin 286.7)$$

$$(10.44)^6 (\cos 1720.2 + j \sin 1720.2)$$

$$1294800.9 (\cos 1720.2 + j \sin 1720.2)$$

$$229289.5 - 1274337.4j$$

i) $(-3 + 8j)^5$



$$r = 8^2 + 3^2$$

$$r = 8.5$$

$$\theta = 180 - 69.4$$

$$\theta = 110.6^\circ$$

$$\text{DMT} = (8.5)^5 (\cos 553 + j \sin 553)$$

$$= 44370.5 (\cos 553 + j \sin 553)$$

$$= -443233.3 - 9981.2j$$

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$$d) j^5 \times j^3 = 2$$

$$\begin{aligned} e) \bar{z}_1 z_2 \bar{z}_3 &= (9-4j)(-7-5j)(2+5j) \\ &= (-63-45j+28j+20j^2)(2+5j) \\ &= (-63-17j-20)(2+5j) \\ &= (-83-17j)(2+5j) \\ &= -166-415j-34j-85j^2 \\ &= -81-450j \end{aligned}$$