

Pg 1

Maths assessment 2-06/01/21
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$$\text{Q2 - a) } Z_1 + Z_3 \\ (3 + 7j) + (-4 - j) \\ 3 + 7j + -4 - j \\ \underline{-1 + 6j}$$

$$\text{ii) } Z_1 - Z_3 \\ (3 + 7j) - (-4 - j) \\ 3 + 7j + 4 + j \\ \underline{7 + 8j}$$

$$\text{iii) } \frac{Z_1}{Z_2} \quad \frac{3 + 7j}{2 - 10j}$$

$$\frac{3 + 7j}{2 - 10j} \times \frac{2 + 10j}{2 + 10j}$$

$$\frac{(3 + 7j)(2 + 10j)}{(2 - 10j)(2 + 10j)}$$

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

$$\frac{6 + 44j - 70}{4 + 100}$$

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

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

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iv)

$$Z_1 - Z_2$$

$$(3+7j) - (2-10j)$$

$$3+7j-2-10j$$

$$1+17j$$

v)

$$(Z_3)^3 - Z_1$$

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

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$$B) \quad 8x^2 = -3x - 18$$

$$8x^2 + 3x + 18 = 0$$

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

$$x = \frac{-3 \pm \sqrt{9 - 576}}{16}$$

$$x = \frac{-3 \pm \sqrt{-576}}{16}$$

$$x = \frac{-3 \pm \sqrt{-1 \times 576}}{16}$$

$$x = \frac{-3 \pm \sqrt{1} \times \sqrt{16}}{16}$$

$$x = \frac{6 \pm j \times 4}{16}$$

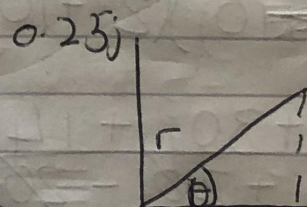
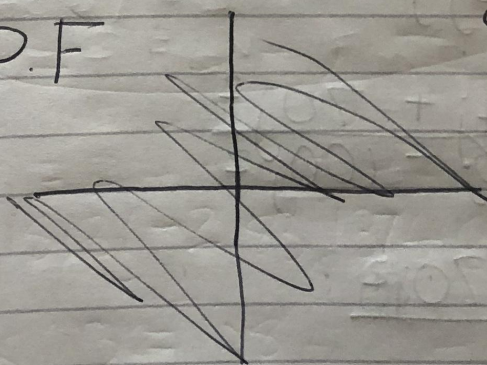
$$x = \frac{6 + 4j}{16}$$

$$x = \frac{6 - 4j}{16}$$

$$0.375 + 0.25j$$

$$0.375 - 0.25j$$

in P.F



0.375 real

$$r^2 = 0.375^2 + 0.25^2$$

$$r = \sqrt{0.141 + 0.0625}$$

$$r = \sqrt{0.2035}$$

$$r = \underline{\underline{0.451}}$$

$$\tan \theta = \frac{0.25}{0.375}$$

$$\theta = \tan^{-1} \left(\frac{0.25}{0.375} \right)$$

$$\theta = 33.69^\circ$$

$$0.451 (\cos 33.69 + j \sin 33.69)$$

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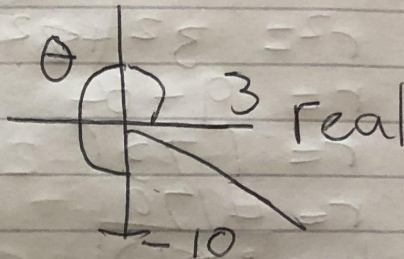
$$c) (3 - 10j)^6 \quad r^n (\cos n\theta + j \sin n\theta)$$

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

$$r = 9 + 100$$

$$r = \sqrt{109}$$

$$r = \underline{10.44}$$



$$\tan \theta = \frac{10}{3}$$

$$\theta = \tan^{-1}\left(\frac{10}{3}\right)$$

$$\theta = 73.3^\circ$$

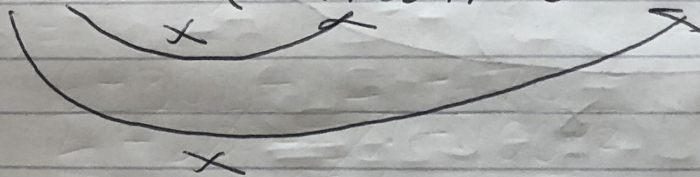
$$\theta = 360 - 73.3$$

$$\theta = \underline{286.7^\circ}$$

$$10.44^6 (\cos 6 \times 286.7 + j \sin 6 \times 286.7)$$

$$P.F. 1294800.898 (\cos 1720.2 + j \sin 1720.2)$$

$$1294800.898 (0.1770847403 + -0.984195608j)$$



$$= 229289.4808 - 1274337.357j \text{ Cartesian}$$

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

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

$$r = \sqrt{9 + 64}$$

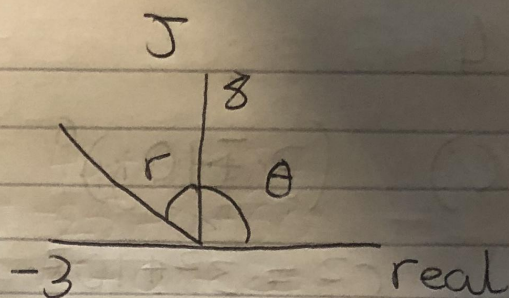
$$r = \sqrt{73}$$

$$r = 4.179$$

$$\tan^{-1} \left(\frac{8}{3} \right)$$

$$\theta = \tan^{-1} \left(\frac{8}{3} \right)$$

$$\theta = 69.443^\circ$$



$$\theta = 180 - 69.443$$

$$\theta = 110.557$$

$$4.179^5 (\cos 5 \times 110.557 + j \sin 5 \times 110.557)$$

$$1274.565611 (\cos 552.835 + j \sin 552.835)$$

$$1274.565611 (-0.4750138361 + -0.2221441411j)$$

P.F

$$1274.565611 (-0.4750138361 + -0.2221441411j)$$

$$-1242.718131 - 283.1374048j \text{ Cartesian}$$

d) $j^5 \times j^3 = j^8$

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Q1 - matrices

a) $A = \begin{pmatrix} 8 & -1 & 7 \\ -5 & 2 & 5 \\ 3 & 0 & 2 \end{pmatrix} \quad B = \begin{pmatrix} -2 & 8 & 0.5 \\ 2 & 5 & 2 \\ 0 & -9 & 1 \end{pmatrix}$

$C = \begin{pmatrix} 2 & 5 \\ -6 & 0 \\ 1 & 12 \end{pmatrix} \quad D = \begin{pmatrix} 8 & 14 \\ 0.25 & 21 \end{pmatrix}$

i) ~~A x B~~

$AB = \begin{pmatrix} -16 + -2 + 0 & 64 + -5 + -63 & 4 + -2 + 7 \\ -10 + 4 + 0 & -40 + ~~10~~ + 45 & -2.5 + 4 + 5 \\ -6 + 0 + 1 & 24 + 0 + ~~10~~ + 18 & 1.5 + 0 + 2 \end{pmatrix}$

$AB = \begin{pmatrix} -18 & -4 & 9 \\ -6 & -75 & 6.5 \\ -5 & 6 & 3.5 \end{pmatrix}$

ii) $BA = \begin{pmatrix} -16 + 10 + 1.5 & 2 + 16 + 0 & -14 + 40 + 1 \\ 16 + -25 + 6 & -2 + 10 + 0 & 14 + 25 + 4 \\ 0 + 45 + 3 & 0 + -18 + 0 & 0 + 45 + 2 \end{pmatrix}$

$BA = \begin{pmatrix} 54.5 & 18 & 26 \\ -3 & 8 & 43 \\ 48 & -18 & 47 \end{pmatrix}$

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$$\text{iii) } AC = \begin{pmatrix} 16+6+7 & 40+0+84 \\ -10+-18+5 & -25+0+60 \\ 6+0+2 & 15+0+24 \end{pmatrix}$$

$$AC = \begin{pmatrix} 29 & 124 \\ -17 & 45 \\ 8 & 39 \end{pmatrix}$$

$$\text{iv) } CA = \begin{pmatrix} 2 & 5 \\ -6 & 0 \\ 1 & 12 \end{pmatrix} \quad A = \begin{pmatrix} 8 & -1 & 7 \\ 5 & 2 & 5 \\ 3 & 0 & 2 \end{pmatrix}$$

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

cannot multiply

$$\text{v) } |A| = \begin{vmatrix} 8 & -1 & 7 \\ 5 & 2 & 5 \\ 3 & 0 & 2 \end{vmatrix}$$

$$\begin{aligned} |A| &= 8(4-0) - (-1)(15-10) + 7(6-0) \\ &= 8(4) + 1(5) + 7(6) \\ &= 24 + 5 + 42 = \underline{71} \end{aligned}$$

$$\text{vi) } B = \begin{pmatrix} -2 & 8 & 0.5 \\ 2 & 5 & 2 \\ 0 & -9 & 1 \end{pmatrix}$$

$$\begin{aligned} |B| &= -2(-18-5) - 8(0-2) + 0.5(-18-0) \\ &= -2(-23) - 8(-2) + 0.5(-18) \\ &= -46 + 16 - 9 \\ &= \underline{-49} \end{aligned}$$

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Vii)

$$A \begin{pmatrix} 8 & -1 & 7 \\ -5 & 2 & 5 \\ 3 & 0 & 2 \end{pmatrix} \quad B \begin{pmatrix} -2 & 4 & 0.5 \\ 2 & 5 & 2 \\ 0 & -9 & 1 \end{pmatrix}$$

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