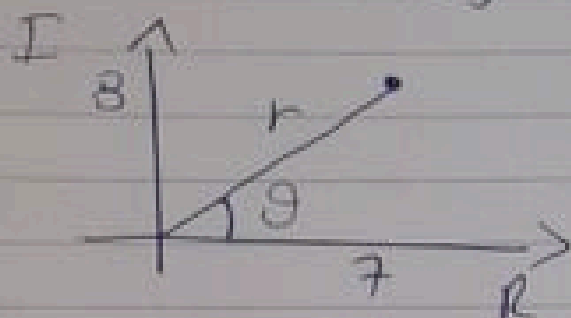


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13:20 Pg 9

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



$$r^2 = 7^2 + 8^2 \\ r = \sqrt{113}$$

$$7 = r \cos \theta$$

$$8 = r \sin \theta$$

$$\Rightarrow \tan \theta = \frac{8}{7}$$

$$\theta = \arctan \frac{8}{7} = 48.81^\circ$$

$$\Rightarrow z = \sqrt{113} (\cos(48.81^\circ) + j \sin(48.81^\circ))$$

$$\Rightarrow \boxed{z = 7.00056 + j 7.9995}$$

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

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

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

$$|A| = 2(-4 - 5) - 3(-2 - 15) + 2(1 - 6)$$

$$|A| = -18 + 34 - 10$$

$$\boxed{|A| = 6}$$

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

$$|A_1| = 14(-4 - 5) - 3(-8 - 95) + 2(4 - 38)$$

$$|A_1| = -126 + 309 - 68$$

$$\boxed{|A_1| = 115}$$

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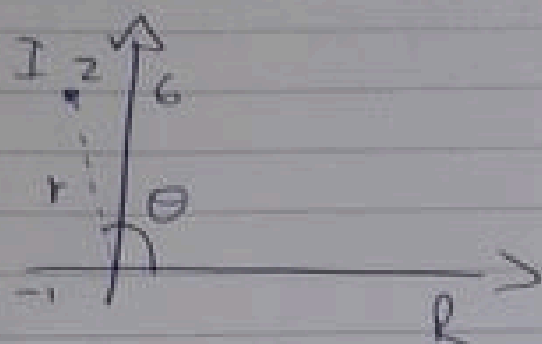
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pg 8

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$$2) \quad z_1 = 3 + 7j \quad z_2 = 2 - 10j \quad z_3 = -4 - j$$

$$(i) \quad 3 + 7j - 4 - j = -1 + 6j$$



$$\tan \theta = \frac{6}{-1} \quad \begin{cases} 6 = r \sin \theta \\ -1 = r \cos \theta \end{cases}$$

$$\theta = -1.405$$

$$\Rightarrow \theta = -1.405 + \pi = 1.736$$

$$r^2 = 6^2 + 1^2$$
$$r^2 = 37$$
$$r = \sqrt{37}$$
$$r^h (\cos \theta + j \sin \theta)$$

~~1.736~~

$$z = \sqrt{37} (\cos(1.736) + j \sin(1.736))$$

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$$c) \quad w = \begin{pmatrix} 2 & 4x & -5 \\ 4 & x & 0 \\ 1 & (x+1) & 3 \end{pmatrix}$$

$$|w| = 2$$

$$|w| = 2(3x - 0) - 4x(12 - 0) + (-5)((4x+3) - x)$$

$$2 = 6x - 48x - 15x - 20$$

$$+ 57x = -22$$

$$\boxed{x = \frac{-22}{57}}$$



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

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

$$\Rightarrow \frac{-3 \pm \sqrt{9 - 4 \cdot 8 \cdot 18}}{2 \cdot 8}$$

$$= \frac{-3 \pm \sqrt{-567}}{16} = \frac{-3 \pm j9\sqrt{7}}{16}$$

$$\frac{-3 + j9\sqrt{7}}{16}$$

$$\frac{-3 - j9\sqrt{7}}{16}$$

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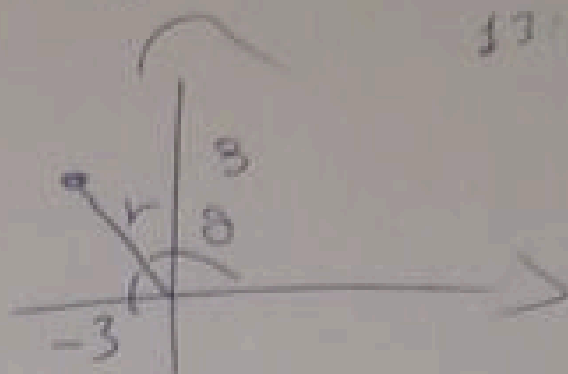
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$$(ii) (-3 + 8j)^5$$



$$\tan \theta = -69.44$$

$$r^2 = 9 + 64$$

$$r = \sqrt{73}$$

$$(\sqrt{73})^5 \left(\cos(5)(-69.44) + j \sin(5)(-69.44) \right)$$

$$45530.996 \left(\cos(-347.2) + j \sin(-347.2) \right)$$

$$(d) j^5 \times j^3 = j \times (-j) = -j^2 = \underline{\underline{1}}$$

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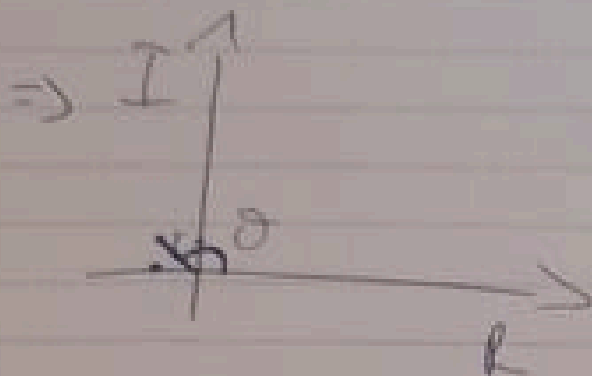
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$$\frac{-16 + 11j}{26}$$

$$= \frac{-16}{26} + \frac{11j}{26}$$



$$r^2 = \left(\frac{-16}{26}\right)^2 + \left(\frac{11}{26}\right)^2$$

$$r^2 = \frac{64}{169} + \frac{121}{676}$$

$$\Rightarrow r = \frac{\sqrt{377}}{26}$$

$$\Rightarrow \tan \theta = \frac{\frac{11}{26}}{\frac{-16}{26}}$$

$$\theta = -34.51$$

$$\Rightarrow \theta = 180 + (-34.51)$$

$$\boxed{\theta = 145.49}$$

$$\frac{\sqrt{377}}{26} \times (\cos(145.49) + j \sin(145.49))$$

Dg. 17

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(F) $\bar{x}$ is the conjugate number of x
means that we change the sign
of the term (e.g. $x = 2 + 3j$
 $\Rightarrow \bar{x} = 2 - 3j$)

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(viii) $AB+D$

$$\begin{pmatrix} -18 & -4 & 9 \\ 14 & -75 & -1.6 \\ -6 & 6 & 3.5 \end{pmatrix} + \begin{pmatrix} 8 & 14 \\ 0.25 & 21 \end{pmatrix}$$

$\Rightarrow$ Not mathimatically possible

$$b) \begin{pmatrix} 15x^2 + 4x - 17 & 1 & 11 \\ 2 & 0 & -2 \\ 2 & -2 & x^4 \end{pmatrix} = \begin{pmatrix} y & 1 & 11 \\ 2 & 0 & -2 \\ 2 & -2 & y^2 \end{pmatrix}$$

$$15x^2 + 4x - 17 = y$$

$$y^2 = x^4 \\ \Rightarrow y = x^2$$

$$14x^2 + 4x - 17 = 0$$

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-4 \pm \sqrt{4(14)(+17) + 16}}{28}$$

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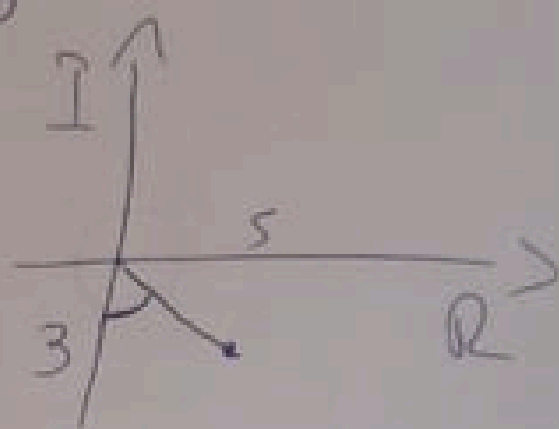
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(iv) $z_1 - z_2$

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

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

$$\Rightarrow \boxed{5 - 3j}$$



$$\tan \cdot = \frac{5}{3} = 59.036$$

$$\Rightarrow \theta = \overset{180}{\cancel{0}} - 59.036$$

$$\theta = \cancel{0} 120.96$$

$$r^2 = 25 + 9$$

$$\boxed{r = \sqrt{34}}$$

$$\boxed{\sqrt{34} (\cos(120.96) + j \sin(120.96))}$$

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(c)

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

$$\tan \theta = \frac{-10}{3}$$
$$\boxed{\theta = -73.30^\circ}$$

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

$$r^2 = 9 + 100$$

$$r = \sqrt{109}$$

$$(\sqrt{109})^6 (\cos(6)(-73.30) + j \sin(6)(-73.30))$$

$$\Rightarrow (\sqrt{109})^6 (0.177 + j \sin 0.0135)$$

$$\Rightarrow \boxed{1295029 (\cos(6)(-73.30) + j \sin(6)(-73.30))}$$

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$$|A_3| = \begin{vmatrix} 2 & 3 & 14 \\ 1 & 2 & 4 \\ 3 & 1 & 19 \end{vmatrix}$$

$$\Rightarrow |A_3| = 2(38 - 4) - 3(19 - 12) + 14(1 - 6)$$

$$|A_3| = 68 - 21 + 70$$

$$|A_3| = 117$$

$$|A| = 6 \quad |A_1| = 115 \quad |A_2| = 46 \quad |A_3| = 117$$

$$x = \frac{|A_1|}{|A|} = \frac{115}{6}$$

$$y = \frac{|A_2|}{|A|} = \frac{46}{6}$$

$$z = \frac{|A_3|}{|A|} = \frac{117}{6}$$

$$z = \frac{|A_3|}{|A|} = \frac{117}{6} = \frac{39}{2}$$

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$$(v) \quad (z_3)^3 \rightarrow \bar{z}_1$$

$$(-4 - j)^3 \rightarrow \bar{(-3 - 7j)}$$

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$$c) z_1 = 9 + 4j$$

$$z_2 = -7 - 5j$$

$$z_3 = 2 - 5j$$

$$(-9 - 4j)(-7 - 5j)(-2 + 5j)$$

$$(-63 + 45j + 28j + 20j^2)(-2 + 5j)$$

$$(20j^2 + 73j - 63)(-2 + 5j)$$

$$-40j^2 + 100j^3 - 146j + 365j^2 + 126 - 315j$$

$$\Rightarrow 100j^3 + 325j^2 - 461j + 126$$

$$\Rightarrow -100 - 325 - 461j + 126$$

$$\underline{\underline{-299 - 461j}}$$

$$\boxed{P^* = 549.47}$$

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$$(ii) \quad BA = \begin{pmatrix} -16 - 40 + 15 & +2 + 16 + 0 & -14 + 40 + 1 \\ 16 - 25 + 6 & -2 + 10 + 0 & 14 + 25 + 4 \\ 0 + 45 + 3 & 0 - 18 + 0 & 0 - 45 + 2 \end{pmatrix}$$

$$\Rightarrow BA = \begin{pmatrix} 54.5 & 18 & 37 \\ -1 & +8 & 43 \\ 48 & -18 & -43 \end{pmatrix}$$

(iii) AC

$$\Rightarrow \begin{pmatrix} 16 + 6 + 7 & 40 + 0 + 84 \\ -10 - 12 + 5 & -25 + 0 + 60 \\ 6 + 0 + 2 & 15 + 0 + 24 \end{pmatrix}$$

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

(iv) CA = Not mathematically possible

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pg 3

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

$$|A| = 32 - 25 - 42$$

$$|A| = -35$$

$$(vi) |B| = -2(5 + 18) - 3(2 - 0) + 0.5(-18 - 0)$$

$$\Rightarrow |B| = -46 - 6 - 9$$

$$|B| = -71$$

(vii) $A+B$

$$A+B = \begin{pmatrix} 6 & 7 & 6.5 \\ -3 & 7 & 7 \\ 3 & -9 & 3 \end{pmatrix}$$

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Pg 1

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i)
a)

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

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

b)

$$AB = \begin{pmatrix} 8 \\ -2 \\ 3 \end{pmatrix}$$

$$(i) \quad AB = \begin{pmatrix} -16 - 2 + 0 & 64 - 5 - 63 & -6 + 0 + 0 \\ 10 + 4 + 0 & -40 + 10 - 45 & 24 + 0 - 18 \\ -6 + 0 + 0 & 24 + 0 - 18 & 3.5 + 0 + 2 \end{pmatrix}$$

~~83 + 45~~

$\downarrow$

~~83 + 45~~

$$\begin{pmatrix} 4 - 2 + 7 \\ -25 + 4 + 5 \\ 15 + 0 + 2 \end{pmatrix}$$

$$\Rightarrow AB = \begin{pmatrix} -18 & -4 & 9 \\ 14 & -75 & -16 \\ -6 & 6 & 3.5 \end{pmatrix}$$