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Date 6/01/21

Question 2

~~Q~~

a) $z_1 = 3 + 7j$

$z_2 = 2 - 10j$

~~XXXXXXXXXX~~

~~XXXXXXXXXX~~

~~XXXXXXXXXX~~

~~XXXXXXXXXX~~

i) $z_1 + z_2$

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

$3 + 7j + -4 - j$

$-1 + 6j$

ii) $z_1 - z_2$

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

$3 + 7j - -4 - j$

$7 + 8j$

iii) $\frac{z_1}{z_2}$

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

$\frac{z_1}{z_2} = \frac{3 + 7j}{2 - 10j} \quad \frac{2 + 10j}{2 + 10j}$

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

$\frac{6 + 44j + 20}{4 + 100}$

$4 + 100$

$-64 + 44j$

104

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

$$\text{iv) } z_1 - z_2$$

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

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

$$1 + 17j$$

~~vi) $z_1 z_2$~~

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

$$\text{v) } (z_3)^3 - z_1$$

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

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

page 2

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

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

$$ax^2 + bx + c = 0$$

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

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

$$x = \frac{-3 \pm \sqrt{9 + 576}}{2 \times 8}$$

$$x = -3 \pm \sqrt{\quad}$$

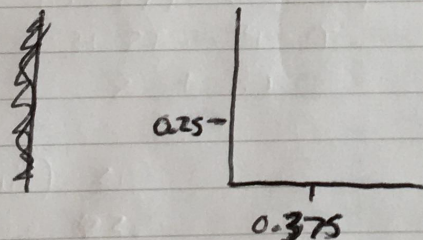
$$x = \frac{-3 \pm \sqrt{\quad}}{16} \quad x = \frac{\sqrt{\quad}}{16}$$

$$\frac{6 + 4T}{16}$$

$$\frac{6 - 4T}{16}$$

$$= 0.375 + 0.25T$$

$$= 0.375 - 0.25T$$



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

$$r = \sqrt{0.25^2 + 0.375^2}$$

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

$$r = \sqrt{0.2035}$$

$$r = 0.451$$

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

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

$$= 33.69^\circ$$

~~XXXXXXXXXXXXXXXXXXXX~~

1)

2)

3)

4)

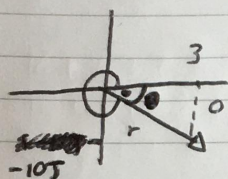
5)

6)

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

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

$r^n (\cos n\theta + j \sin n\theta)$



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

$$r = \sqrt{9 + 100}$$

$$r = \sqrt{109}$$

$$r = 10.44$$

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

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

$$= 73.3^\circ$$

$$\theta = 360 - 73.3^\circ$$

~~$\theta = 360 - 73.3^\circ$~~

$$= 286.7$$

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

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

$$1294800.898 (\cos 1720.2 + j \sin 1720.2)$$

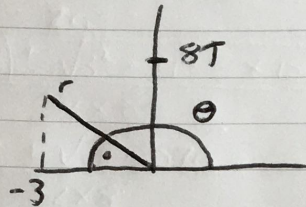
$$1294800 \cdot 898 (0.1770847403 + -0.984195608)$$

$$= 229289 \cdot 4808$$

$$- 1274337 \cdot 3577 \text{ J}$$

$$\text{ii) } (-3 + 8j)^5$$

$$r^n (\cos n\theta + j \sin n\theta)$$



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

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

$$r = \sqrt{73}$$

$$r = 4.179$$

$$\tan = \frac{8}{3}$$

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

$$= 69.44$$

$$\theta = 180 - 69.44$$

$$= 110.567^\circ$$

$$4.179^5 (\cos 5 \times 110.567 + j \sin 5 \times 110.567)$$

$$1274.564611 (\cos 552.835 + j \sin 552.835)$$

$$1274.564611 (-0.97501838361 + -0.222144411j)$$

$$- 1242.718131$$

$$- 283.1374048j$$

b)

$$\tau^5 \times \tau^3$$

$$\tau^{5+3}$$

$$\tau^8$$

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Question 1

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

$r \times c$

3×3

$r \times c$

3×3

i) AB

$$-16 + -2 + 0$$

$$64 + -5 + -63$$

$$4 + -2 + 7$$

$$-10 + 4 + 0$$

$$-40 + 10 + -45$$

$$2.5 + 4 + 5$$

$$-6 + 0 + 1$$

$$24 + 0 + -18$$

$$1.5 + 0 + 2$$

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

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

$r \times c$

3×3

$r \times c$

3×3

ii) BA

$$-16 + -40 + 15$$

$$24 + 16 + 0$$

$$-14 + 40 + 0$$

$$16 + -25 + 16$$

$$-2 + 10 + 0$$

$$14 + 25 + 4$$

$$0 + 45 + 3$$

$$0 + -18 + 0$$

$$0 + -45 + 2$$

$$54.5$$

$$18$$

$$26$$

$$-3$$

$$8$$

$$43$$

$$48$$

$$-18$$

$$-48$$

~~$$A = \begin{pmatrix} 8 & -1 & 7 \\ -5 & 2 & 5 \\ 3 & 0 & 2 \end{pmatrix} \quad C = \begin{pmatrix} 2 & 5 \\ -6 & 0 \\ 1 & 12 \end{pmatrix}$$~~

~~A cannot be multiplied due to different rows and columns~~

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

$$r \times c \\ 3 \times 3$$

$$r \times c \\ 2 \times 3$$

ii) AC

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

$$\begin{array}{ll} 29 & 124 \\ -17 & 45 \\ 8 & 39 \end{array}$$

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

$$r \times c \\ 3 \times 2$$

$$r \times c \\ 3 \times 3$$

iv) CA

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