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paper math's

Date 23/09/2020

Q NO :→1

part (a)

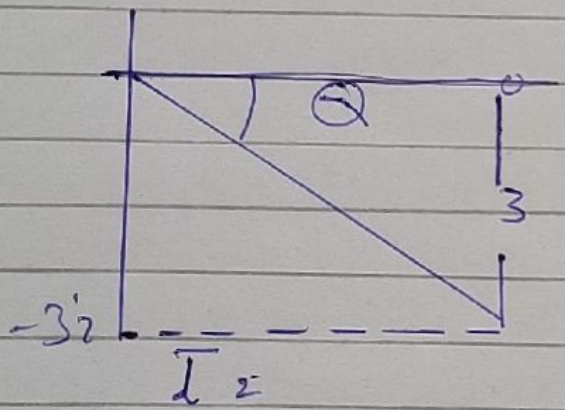
(a) Represent $z = 3 - 3i$ in polar from

Ans :->

Step 1 ::

$z = 3 - 3i$

Find $\theta$ (help to plot z on complex place)




z is in Qudrent 4

$\theta$ is b/w $-\frac{I}{2}$ and 0

$\text{Tan}\,\theta = \frac{-3}{3} = -1$

$\ominus = \frac{-\pi}{4}$

Step II ::

Find modeul $|z|$

$|z| = \sqrt{3^2+(-3)^2} = \sqrt{18} = \sqrt{9}\sqrt{2}$

$\Rightarrow 3\sqrt{2}$

Step III ::

write 2

on polar from

$z = 3\sqrt{2}\left(\cos\left(\frac{\pi}{4}\right)\right.$

also know as

$3\sqrt{2}\ \cos\left(\frac{-\pi}{4}\right)$

Ans

Q NO:-> 1

part (B)

(b): If $z_1 = 8 + 3i$ and $z_2 = 9 - 2i$ then find $z_1 z_2$

Given Data

$z_1 = 8 + 3i$

$z_2 = 9 - 2i$

Required

$z_1 z_2$

Solution

$$z_1 z_2 = (8 + 3i)(9 - 2i)$$

$$\Rightarrow 8(9 - 2i) + 3i(9 - 2i)$$

$$\Rightarrow 72 - 16i + 27i - 6i^2$$

$$\Rightarrow 72 + 11i - 6(-1)$$

$$= 72 + 11i + 6$$

$$= 78 + 11i$$ Ans

Q No :-> 02

Find the slope of the Circle $x^2+y^2=25$ at point $(3,-4)$

Ans :->

Solution :->

We know that we find the slope we take Differentiate the function

So differentiate the function w.r.t $x^2$

$$\frac{d}{dx}(x^2+y^2) = \frac{d}{dx}25$$

$$\Rightarrow 2x + 2y\frac{dy}{dx} = 0$$

$$2y\frac{dy}{dx} = -2x$$

Divide B.S by $2y$

$$\frac{2y}{2y}\frac{dy}{dx} = \frac{-2x}{2y}$$

$$\frac{dy}{dx} = \frac{-x}{y}$$

Putting Point

$$\left(\frac{3}{x} \cdot \frac{-4}{y}\right)$$

$$\frac{dy}{dx} = +\frac{(3)}{+4}$$

So the Slope of Circle are $\frac{3}{4}$

Q No :-> 3

Estimate the angle between $A = t - 2j - 2k$ and $B = 6t + 3j + 2k$

Ans :-> Solution :->

$A = j - 2j - 2k$

$B = 6j + 3j + 2k$

We know that

$$\text{Tan}\theta = \frac{A \cdot B}{|A|\,|B|} \quad \text{---} \star$$

$A \cdot B = (j - 2j - 2k)(6j + 3j + 2k)$

$(1 \times 6) - (2 \times 3) - (2 \times 2)$

$\Rightarrow 6 - 6 - 4$

$\Rightarrow \boxed{A \cdot B = -4}$ ——— (1)

$$|A| = \sqrt{(1)^2 + (-2)^2 + (-2)^2}$$

$$\Rightarrow |A| = \sqrt{1+4+4}$$

$$|A| = \sqrt{(1)^2 + (-2)^2 + (-2)^2}$$

$$\Rightarrow |A| = \sqrt{1+4+4}$$

$$|A| = \sqrt{9} = \sqrt{3^2}$$

$$\Rightarrow \boxed{|A| = 3} \quad \text{— (ii)}$$

$$|B| = \sqrt{(6)^2 + (3)^2 + (2)^2}$$

$$|B| = \sqrt{36+9+4}$$

$$= \sqrt{49}$$

$$|B| = 7 \quad \text{— (iii)}$$

Putting (i) (ii) (iii)

$$\text{Tan}\theta = \frac{-4}{3 \times 7} = \frac{-4}{21}$$

$$\tan\theta = \frac{-4}{21}$$

$$\theta = \tan^{-1}\left(\frac{-4}{21}\right)$$

$$\theta = -10.7579$$

Ans

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Q No :-> 4

Evaluate $\int \left(\frac{1}{x^2} - x^2 - \frac{1}{3}\right) dx$

Ans :->

Solution :->

$$\int \frac{1}{x^2}\, dx - \int x^2\, dx - \frac{1}{3}\int dx$$

$$\Rightarrow \int x^{-2}\, dx - \int x^2\, dx \frac{1}{3}\int dx$$

$$\Rightarrow \frac{x^{-2+1}}{-2+1} - \frac{x^{2+1}}{2+1} - \frac{1}{3}x$$

$$\Rightarrow \frac{x^{-1}}{-1} - \frac{x^3}{3} - \frac{1}{3}x$$

$$\Rightarrow \frac{-1}{x} - \frac{1}{3}x^3 - \frac{1}{3}x + C$$

Ans

Q NO 5 :-> Evaluate $\int \sin^2 x \, dx$

Ans:: we know that

$$\cos 2x = \cos^2 x - \sin^2 x$$

$$\cos^2 x + \sin^2 x = 1$$

$$\cos^2 x = 1 - \sin^2 x$$

So

$$\cos^2 x = 1 - 2\sin^2 x$$

$$\cos^2 x = 1 - 2\sin^2 x$$

$$\Rightarrow 2\sin^2 x = \frac{1}{2} - \frac{\cos 2x}{2}$$

So:

$$\int \sin^2 x \, dx = \int \tfrac{1}{2} - \cos 2x \, dx$$

$$\Rightarrow \frac{x}{2} - \frac{\sin 2x}{2} \times \tfrac{1}{2} + c$$

$$\Rightarrow \frac{x}{2} - \frac{\sin 2x}{4} + C$$

Ans