B TECH ELECTRICAL

NAME MUHHMMAD ABBAS

ID 16721

Q1 e- (a) Represent $z = 3 - 3i$ in polar form

Sol e-

The polar form of a comlex number $z = 3 - 3i$ is

$z = r(\cos\theta - i\sin\theta)$

where

$$r = |z| = \sqrt{a^2 + b^2}$$

$$= \sqrt{(3)^2 + (-3)^2}$$

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

$$= \sqrt{18}$$

$$\boxed{= 4.242}$$

Now we find the argument θ

Sin as θ use the formula

$$\theta = \tan^{-1}\left(\frac{b}{a}\right)$$

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

$$\theta = \tan^{-1}(1)$$

$$\theta = 45^\circ$$

i.e the polar form of $3 - 3i$ is

$$= 4.24(\cos(45) - i\sin(45))$$

(v)

SOL^{n}-

$$z_1 = 8+3i \quad \& \quad z_2 = 9-2i$$

$$z_1 z_2 = ?$$

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

$$= 72 - 16i + 27i - 6i^2$$

$$= 72 + 11i + 6$$

$$\boxed{= 78 + 11i}$$

Ans

Q5 $\int \sin^2 x \, dx$

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

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

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

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

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

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

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

$= \int \left(\frac{1}{2} - \frac{\cos 2x}{2}\right) dx$

$= \frac{1}{2}\int dx - \frac{1}{2}\int \cos 2x \, dx$

$= \frac{x}{2} - \frac{\sin 2x}{2} \times \frac{1}{2} + C$

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

Ans

Q4 Evaluate $\int \left(\frac{1}{x^2} - x^2 - \frac{1}{3}\right) dx$ page (4)

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

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

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

$$= \frac{x^{-1}}{-1} - \frac{x^3}{3} - \frac{x}{3} + c$$

$$= -\frac{1}{x} - \frac{x^3}{3} - \frac{x}{3} + c$$

Ans

Q 3 b-

Estimate the angle between

$A = i - 2j - 2k$ & $B = 6i - 3j + 2k$

Sol e-

$A = i - 2j - 2k$

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

$\Rightarrow \vec{A} \cdot \vec{B} = |A| \cdot |B| \cos\theta$

Now 1st we find $|A|$

$$|A| = \sqrt{(1)^2 + (-2)^2 + (-2)^2} = \sqrt{1+4+4} = \sqrt{9}$$

$$= 3$$

Now 2nd we find $|B|$

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

$$= \sqrt{36 + 9 + 4} = \sqrt{49} = 7$$

Now we find $\vec{A} \cdot \vec{B}$

$$\vec{A} \cdot \vec{B} = (i - 2j - 2k)(6i - 3j + 2k)$$

$$\vec{A} \cdot \vec{B} = 6 + 6 - 4$$

$$= 12 - 4 = 8$$

Now put the values in Page(6)

$$\vec{A} \cdot \vec{B} = |A| \cdot |B| \cos\theta$$

$$8 = (3)(7)\cos\theta$$

$$8 = 21\cos\theta$$

$$21\cos\theta = 8$$

$$\cos\theta = \frac{8}{21}$$

$$\cos\theta = 0.3809$$

$$\theta = \cos^{-1}(0.3809)$$

$$\boxed{\theta = 67^\circ}$$

Ans

$x^2 + y^2 = 25$ at $(-3, 4)$

diff w.r.t x

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

$$\frac{d}{dx} x^2 + \frac{d}{dx} y^2 = 0$$

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

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

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

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

$$m = \frac{-x}{y}$$

$x = -3 \quad y = 4$

$$m = -\frac{(-3)}{4}$$

$$m = \frac{3}{4} \text{ dy}$$

OR

m = slope = $3/4$