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SUBJECT # COMPLEX AND MULTIVARIABLE CALCULUS

SEMESTER # 8TH

DEPARTMENT # BEE

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QUESTION

NO 2

2) Express the equation of the plane passing through the point (5, -2, 4) that is perpendicular to the plane $3x + y - 6z + 8 = 0$.

SOLUTION :-

⇒ Points (5, -2, 4)

~~Poin~~

⇒ plane $(3x + y - 6z + 8 = 0)$

⇒ $v = 3i + j - 6k$

⇒ $l(t) = (5, -2, 4) + t(3, 1, -6)$

$= (5 + 3t)i - (2 - t)j + (4 - 6t)k$

$x = 5 + 3t$, $y = -2 + t$

$z = 4 - 6t$

Ans

QUESTION No 3

3) Given $a = <2, -1, 6>$ and
$b = <-3, 5, 1>$ express $a \times b$.

SOLUTION:-

$a \times b = (a_2 b_3 - a_3 b_2)i + (a_3 b_1 - a_1 b_3)j$
$+ (a_1 b_2 - a_2 b_1)k$

$= ((-1)1 - 6 \times 5)i + (6 \times (-3) - 2 \times 1)j$
$+ (2 \times 5 - (-1) \times (-3))k$

$= (-1 - 30)i + (-18 - 2)j + (10 - 3)k$

$= -31i - 20j + 7k$

$= <-31, -20, 7>$ Ans

QUESTION NO 5

5) Gives All values of $\sin^{-1}\sqrt{5}$.

SOLUTION:-

$$\sin^{-1}\sqrt{5} = -i\ln\sqrt{5}i + (1-(\sqrt{5})^2)^{1/2}]$$

$$(1-(\sqrt{5})^2)^{1/2} = (-4)^{1/2} = \pm 2i$$

$$\sin^{-1}\sqrt{5} = -i\ln[(\sqrt{5}\pm 2)i]$$

$$= -i[\log_e(\sqrt{5}\pm 2) + (\frac{\pi}{2} + 2n\pi)i],$$

$$= n = 0, \pm 1, \pm 2, \ldots$$

Nothing that

$$\log_e(\sqrt{5}-2) = \log_e \frac{1}{\sqrt{5}+2} = ~~\log_e(\sqrt{5}~~$$

$$= -\log_e(\sqrt{5}+2)$$

Thus for $n = 0, \pm 1, \pm 2, \ldots$

$\sin^{-1}\sqrt{5} = \frac{\pi}{2} + 2n\pi \pm i\log_e(\sqrt{5}+2)$

Taking Derivatives

⇒ If we define $w = \sin^{-1} z$, $z = \sin w$

then,

$\frac{d}{dz} z = \frac{d}{dz} \sin w$ gives $\frac{dw}{dz} = \frac{1}{\cos w}$

Using $\cos^2 w + \sin^2 w = 1$, $\cos w =$

$(1 - \sin^2 w)^{1/2} = (1 - z^2)^{1/2}$

Thus

$$\frac{d}{dz} \sin^{-1} z = \frac{1}{(1-z^2)^{1/2}}$$

$$\frac{d}{dz} \cos^{-1} z = \frac{-1}{(1-z^2)^{1/2}}$$

$$\boxed{\frac{d}{dz} \tan^{-1} z = \frac{1}{1+z^2}}$$

Ans