Name of College - S.S. College, J-Bad
Deptt - Mathematics
Topic - Sl. line (Contd)
Class - B.Sc. I (Hons + Sub)
Date - 12-08-2020 Time - 1.00 PM to 1.45 PM

PAGE NO. 1
DATE: 12-08-2020

1. Problem - By - Dr. Shree Nath Sharma.

Find the Co-ordinate of the point of Intersection of the line

$$\frac{x-1}{2} = \frac{y-2}{-3} = \frac{z+3}{4}$$

with the plane $2x - 2y - z = 7$

Solution → By the question

Equation of Sl. line is

$$\frac{x-1}{2} = \frac{y-2}{-3} = \frac{z+3}{4} \quad \text{——— (i)}$$

and Equation of Plane is

$$2x - 2y - z = 7 \quad \text{——— (ii)}$$

A/Q are to find the point of intersection of the given line with the given plane.

Say $\frac{x-1}{2} = \frac{y-2}{-3} = \frac{z+3}{4} = k$

$\Rightarrow x = 2k+1 \quad y = -3k+2, \quad z = 4k-3$

Putting these value of x, y, z in (ii)

$$2(2k+1) - 2(-3k+2) - (4k-3) = 7$$
$$4k + 6k - 4k + 2 - 4 + 3 = 7$$
$$6k = 6$$
$$k = 1$$

$\therefore x = 2+1 = 3$
$y = -3+2 = -1$
$z = 4-3 = 1$

Thus the required Co-ordinate of point of intersection of given line with given plane is $(3, -1, 1)$

Problem :- Find the Equation of the Plane through the line $3x-4y+5z=10$ and $2x+2y-3z=4$ and parallel to $x=2y=3z$

Solution :→ Here the Given plane

$3x-4y+5z=10$ (i) and

$2x+2y-3z=4$ (ii)

and the Q- line

$x=2y=3z$ ——— (iii)

the Equation of plane through the line of intersection of plane (i) and (ii) is

$(3x-4y+5z-10)+k(2x+2y-3z-4)=0$ ——— (iv)

$\Rightarrow (3+2k)x+(2k-4)y+(5-3k)z-10-4k=0$

Since this is parallel to the line

$x=2y=3z$

$\Rightarrow \frac{x}{1}=\frac{y}{1/2}=\frac{z}{1/3}$

$(3+2k)1+(2k-4)\times\frac{1}{2}+(5-3k)\frac{1}{3}=0$

$\Rightarrow 3+2k+k-2+\frac{5-3k}{3}=0$

$\Rightarrow 9+6k+3k-6+5-3k=0$

$6k+8=0$

$k=-8/6=-4/3$

DATE: 12-08-2020

Put $k = -4/3$ in (iv)

$$(3x-4y+5z-10) - \frac{4}{3}(2x+2y-3z-4) = 0$$

$$\Rightarrow (3x-4y+5z-10)\times 3 - 4(2x+2y-3z-4) = 0$$

$$9x-12y+15z-30-8x-8y+12z+16 = 0$$

$$x-20y+27z-14 = 0$$

$$\Rightarrow x-20y+27z = 14$$

Problem - Find the Equation of the perpendicular from the point $(2,4,-1)$ to the line

$$\frac{x+5}{1} = \frac{y+3}{4} = \frac{(z-6)}{9}$$

Obtain also the foot of the perpendicular.

Solution :→

Here Equation of the st. line is

$$\frac{x+5}{1} = \frac{y+3}{4} = \frac{-(z-6)}{9} = r$$

$x = r-5$

$y = 4r-3$ and $-z = 9r-6$

$\Rightarrow z = 6-9r$

This will be the required foot of the perpendicular of the line joining it to the point (2, 4, -1) be Perpendicular to the given line.

∴ the Direction ratios of the line joining the points (1, 4, -1) and (1) are

$r-5-2$, $4r-3-4$, $6-9r+1$

$\Rightarrow r-7$, $4r-7$, $7-9r$

∴ the condition for this

$(r-7)+4(4r-7)-9(7-9r)=0$

$\Rightarrow r-7+16r-28-63+81r=0$

$98r = 98$

$\therefore r=1$

∴ the required foot is

$1-5$, $4\times1-3$, $6-9$

$(-4, 1, -3)$

and Direction ratios of the perpendicular are

$-6, -3, -2$.

Thus the required perpendicular is the line passing through (2, 4, -1) whose direction ratios are 6, 3, 2

∴ Required equation is

$$\frac{x-2}{6} = \frac{y-4}{3} = \frac{z+1}{2}$$