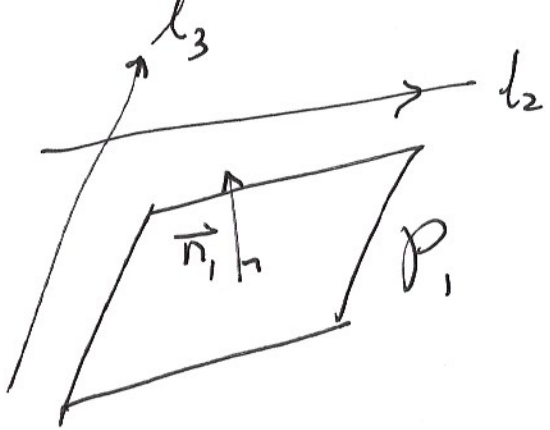
ND THE SIMPLIFIED EQ'N OF THE PLANE } $\mathcal{P}_1$
THROUGH $(-4, 2, -5)$

AND PARALLEL TO $x = 5t - 4$, $y = 1 + 2t$, $z = 3 - t$ (PARAMETRIC EQ'NS OF A LINE $l_2 \rightarrow \vec{d}_2 = \langle 5, 2, -1 \rangle$)

AND ALSO $x = 1$, $\frac{y+2}{3} = -z$ (SYMMETRIC EQ'NS OF A LINE $l_3 \rightarrow \vec{d}_3 = \langle 0, 3, -1 \rangle$)



$\vec{n}_1 \perp \vec{d}_2, \vec{d}_3$

LET $\vec{n}_1 = \vec{d}_2 \times \vec{d}_3$

$$\vec{n}_1 = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 5 & 2 & -1 \\ 0 & 3 & -1 \end{vmatrix} \begin{matrix} \vec{i} & \vec{j} \\ 5 & 2 \\ 0 & 3 \end{matrix} = -2\vec{i} + 15\vec{k} + 3\vec{i} + 5\vec{j}$$

$$= \vec{i} + 5\vec{j} + 15\vec{k}$$

$$= \langle 1, 5, 15 \rangle$$

$\vec{n}_1 = \langle 1, 5, 15 \rangle$

NORMAL EQ'N

$1(x - {}^{-}4) + 5(y - 2) + 15(z - {}^{-}5) = 0$

$x + 5y + 15z + 4 - 10 + 75 = 0$

$x + 5y + 15z + 69 = 0$

MANDATORY SANITY CHECK:

$\langle 1, 5, 15 \rangle \cdot \langle 5, 2, -1 \rangle = 5 + 10 - 15 = 0$ ✓

$\langle 1, 5, 15 \rangle \cdot \langle 0, 3, -1 \rangle = 0 + 15 - 15 = 0$

D SYM EQ'NS FOR THE LINE ℓ_1 THAT IS

ARALLEL TO $3x-z+2=0$ AND $2y-3z-7=0$

PASSES THROUGH $(0,4,-5)$

PLANE P_1 → $\vec{n}_1 = \langle 3,0,-1\rangle$

PLANE P_2 → $\vec{n}_2 = \langle 0,2,-3\rangle$

$\vec{d}_1 \perp \vec{n}_1, \vec{n}_2$

$\vec{d}_1 = \vec{n}_1 \times \vec{n}_2$

$$= \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 3 & 0 & -1 \\ 0 & 2 & -3 \end{vmatrix} \begin{matrix} \vec{i} & \vec{j} \\ 3 & 0 \\ 0 & 2 \end{matrix} = \underset{+2\vec{i}+9\vec{j}}{\overset{6\vec{k}}{}} = \langle 2,9,6\rangle$$

MANDATORY SANITY CHECK:

$\langle 2,9,6\rangle \cdot \langle 3,0,-1\rangle = 6+0-6=0$

$\langle 2,9,6\rangle \cdot \langle 0,2,-3\rangle = 0+18-18=0$ ✓

$\vec{d}_1 = \langle 2,9,6\rangle$

$$\frac{x-0}{2} = \frac{y-4}{9} = \frac{z-(-5)}{6} \rightarrow \frac{x}{2} = \frac{y-4}{9} = \frac{z+5}{6}$$

PLANE THROUGH $(6,-8,2) \leftarrow P_1 \rightarrow \vec{n}_1$

$\perp$ $2y+3z-x=4$, $2y+3x-z=4$

PLANE P_2 PLANE P_3

$\vec{n}_2 = \langle -1, 2, 3 \rangle$ $\vec{n}_3 = \langle 3, 2, -1 \rangle$

$\vec{n}_1 \perp \vec{n}_2, \vec{n}_3$

$\vec{n}_1 = \vec{n}_2 \times \vec{n}_3$

$$= \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ -1 & 2 & 3 \\ 3 & 2 & -1 \end{vmatrix} \begin{matrix} \vec{i} & \vec{j} \\ -1 & 2 \\ 3 & 2 \end{matrix} = -2\vec{i} + 9\vec{j} - 2\vec{k} - 6\vec{i} - \vec{j} - 6\vec{k}$$

$= \langle -8, 8, -8 \rangle$

$\vec{n}_1 = \langle 1, -1, 1 \rangle$

$(x-6) - 1(y-(-8)) + 1(z-2) = 0$

$(x-6) - (y+8) + (z-2) = 0$

$x - y + z - 16 = 0$

$\langle -8, 8, -8 \rangle \cdot \langle -1, 2, 3 \rangle = 8 + 16 - 24 = 0$ ✓

$\langle -8, 8, -8 \rangle \cdot \langle 3, 2, -1 \rangle = -24 + 16 + 8 = 0$ ✓

OR $\vec{n}_1 = \langle -1, 1, -1 \rangle = \frac{1}{8} \langle -8, 8, -8 \rangle$

OR $\langle 1, -1, 1 \rangle = -\langle -1, 1, -1 \rangle$

SYSTEMS OF INEQUALITIES IN 2 VARIABLES

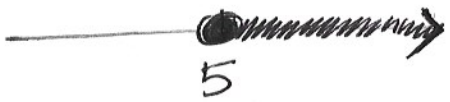
IN 1 VARIABLE

$$-7+7-2x \leq -3+-7$$

$$-2x \leq -10$$

$$\frac{-2x}{-2} \geq \frac{-10}{-2}$$

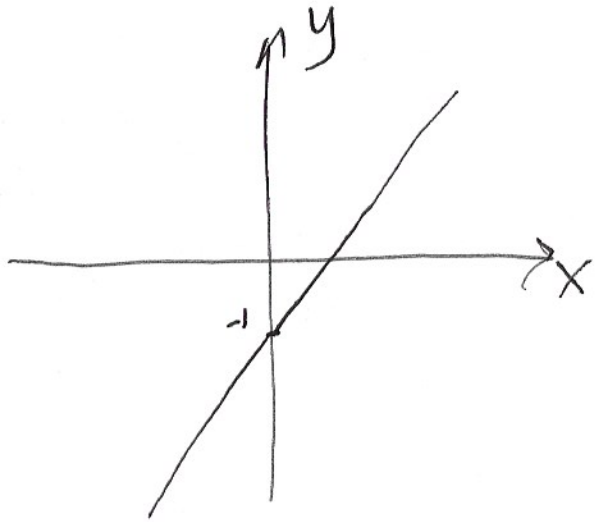
$$x \geq 5$$



SOLUTION SET IN GRAPHICAL FORM

IN 2 VARIABLES

$$y \geq 2x-1$$



① GRAPH EQUALITY

$$y=2x-1$$

② DOTTED → NO =

SOLID → INCLUDES =

③ TEST POINTS + SHADE