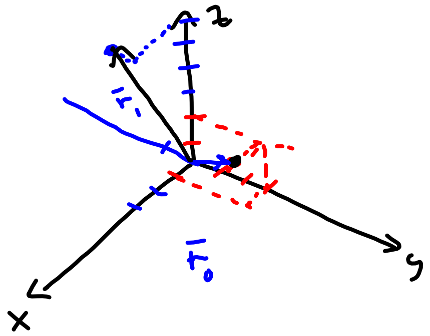
$P(1,3,2)$ & $Q(3,-1,6)$ Not enough info.

However, the plane parallel to

$\bar{r}_0 = \langle 1,3,2 \rangle$ & $\bar{r}_1 = \langle 3,-1,6 \rangle$ & contains

$P(1,3,2)$



$\bar{n} \cdot (\bar{r} - \bar{r}_0) = 0$

$\bar{r} \times \bar{r}_0$: $\langle 3, -1, 6 \rangle$ 3, -1
$\langle 1, 3, 2 \rangle$ 1, 3

$\langle -20, 0, 10 \rangle$

$\bar{n} = \langle -2, 0, 1 \rangle$

OR $\langle 2, 0, -1 \rangle$

$\bar{n} \cdot (\bar{r} - \bar{r}_0) = 0$ $\quad \bar{r} = \langle x, y, z \rangle$

$\bar{n} \cdot (\bar{r} - \bar{r}_1) = 0$ $\quad \bar{r}_0 = \langle 1, 3, 2 \rangle$

$\langle 2, 0, -1 \rangle \cdot \langle x-1, y-3, z-2 \rangle = 0$

$2(x-1) + 0(y-3) - 1(z-2) = 0$

$2x - 2 - z + 2 = 0$

$2x - z = 0$

? Parallel to xz-plane ?

How do you tell if 2 planes are $\parallel$?

P_1 : $\bar{n}_1 \cdot (\bar{r} - \bar{r}_1) = 0$

P_2 : $n_2 \cdot (\bar{r} - \bar{r}_2) = 0$

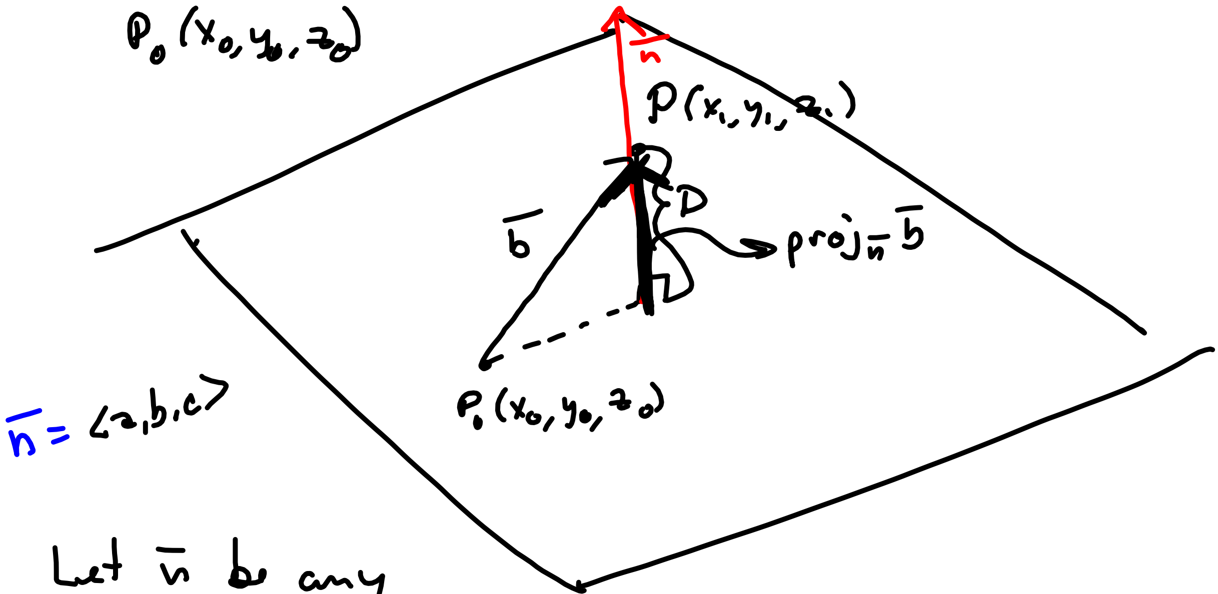
$\bar{n}_1 \times \bar{n}_2 = \bar{0}$ $\quad$ Sine $\|\bar{n}_1 \times \bar{n}_2\| = \|\bar{n}_1\| \|\bar{n}_2\| \sin\theta$

How to tell if $\perp$?

$\bar{n}_1 \cdot \bar{n}_2 = 0$ $\quad$ Cosine $|\bar{n}_1 \cdot \bar{n}_2| = \|\bar{n}_1\| \|\bar{n}_2\| \cos\theta$

Distance from $P(x_1, y_1, z_1)$ to a plane.

0, 0, 0



Let $\bar{n}$ be <u>any</u> normal to the plane.

Find the $|\text{comp}_{\bar{n}}\bar{b}| = D$ $\qquad \bar{b} = \langle x_1 - x_0, y_1 - y_0, z_1 - z_0\rangle$

$$D = \left|\frac{\bar{n}\cdot\bar{b}}{\|\bar{n}\|}\right| = \frac{|\langle a,b,c\rangle \cdot \langle x_1 - x_0, y_1 - y_0, z_1 - z_0\rangle|}{\sqrt{a^2+b^2+c^2}}$$

$$= \frac{|a(x_1 - x_0) + b(y_1 - y_0) + c(z_1 - z_0)|}{\sqrt{a^2+b^2+c^2}} = D$$

§ 1, 2, 3, 5, 7, 11 - 14, 17, 21

$\mathcal{L}_1: \frac{x-2}{1} = \frac{y-3}{-2} = \frac{z-1}{-3} = t$

$t+2=x \quad -2t+3=y \quad -3t+1=z$

$\mathcal{L}_2: \frac{x-3}{1} = \frac{y+4}{3} = \frac{z-2}{-7} = t$ $\quad \mathcal{L}_1: \langle 2,3,1\rangle + t\langle 1,-2,-3\rangle$

$t+3=x, \; 3t-4=y, \; -7t+2=z$ $\quad \mathcal{L}_2: \langle 3,-4,2\rangle + s\,\langle 1,3,-7\rangle$

$s+3=x, \; 3s-4=y, \; -7s+2=z$

$\perp ? \quad \langle 1,-2,-3\rangle \cdot \langle 1,3,-7\rangle = 0?$

$= 16 \neq 0$ Newp!

$x=x$

$t+2=s+3 \quad -2t+3=3s-4 \quad -3t+1=-7s+2$

$t-s=1 \quad -2t-3s=-7 \quad -3t+7s=1$

$-2t-3s=-7$

$-3t+\cancel{7}7s=1$

$$\left[\begin{array}{cc|c} 1 & -1 & 1 \\ -2 & -3 & -7 \\ -3 & 7 & 1 \end{array}\right] \begin{array}{l} R1 \\ 2R1+R2 \\ 3R1+R3 \end{array} \left[\begin{array}{cc|c} 1 & -1 & 1 \\ 0 & -5 & -5 \\ 0 & 4 & 4 \end{array}\right] \begin{array}{l} R1 \\ \frac{1}{5}R2 \\ 4R2+5R3 \end{array} \left[\right.$$

$$\begin{array}{l} \\ \frac{R2}{5} \\ \frac{R3}{4} \end{array} \left[\begin{array}{cc|c} 1 & -1 & 1 \\ 0 & 1 & 1 \\ 0 & 1 & 1 \end{array}\right] \begin{array}{l} R1 \\ R2 \\ -R2+R3 \end{array} \left[\begin{array}{cc|c} 1 & -1 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 0 \end{array}\right]$$

$t-s=1 \longrightarrow t-1=1$

$s=1 \qquad \Longrightarrow t=2$

$s=1, t=2$ Does it.

They do intersect!