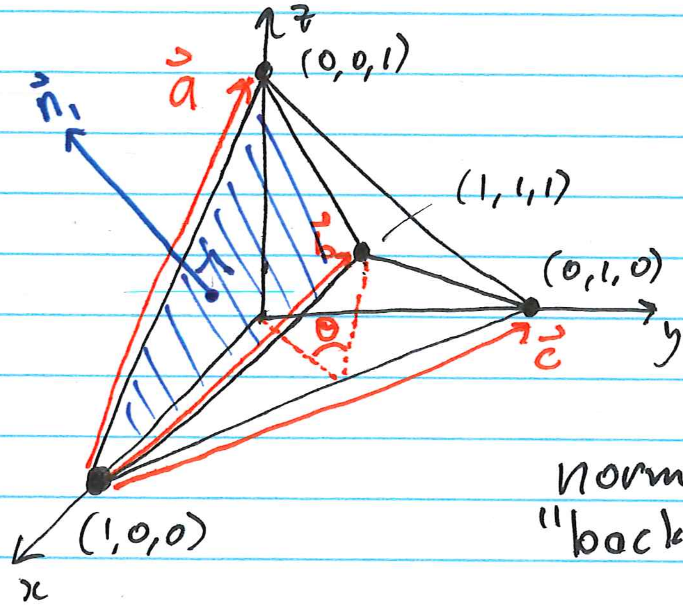
Last day : angles b/w faces of tetrahedron



last day:

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

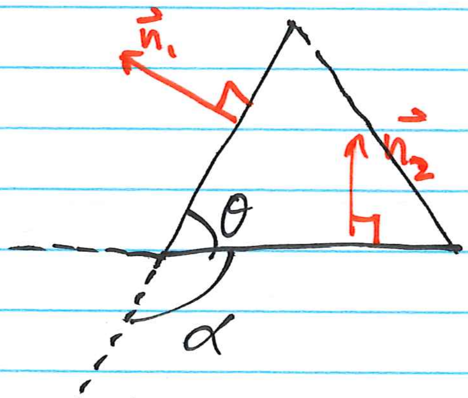
$$\vec{n}_2 = \vec{c} \times \vec{a} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ -1 & 1 & 0 \\ -1 & 0 & 1 \end{vmatrix} = \langle 1, 1, 1 \rangle$$

normal to the "back face"

Angle b/w $\vec{n}_1$ and $\vec{n}_2$: $\cos\theta = \dfrac{\vec{n}_1 \cdot \vec{n}_2}{|\vec{n}_1||\vec{n}_2|} = \dfrac{1}{\sqrt{3}\cdot\sqrt{3}} = 1/3$

$\Rightarrow \theta \approx 71°$

side view

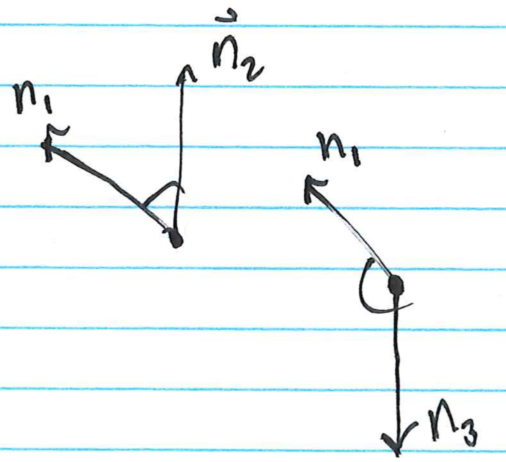


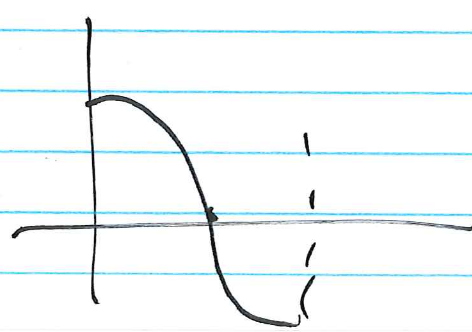
Caution : $\vec{n}_3 = \vec{a} \times \vec{c} = \cancel{\vec{c}\times} = -\vec{n}_2$

$\cos\alpha = \vec{n}_1 \cdot \vec{n}_3 = -1/3$

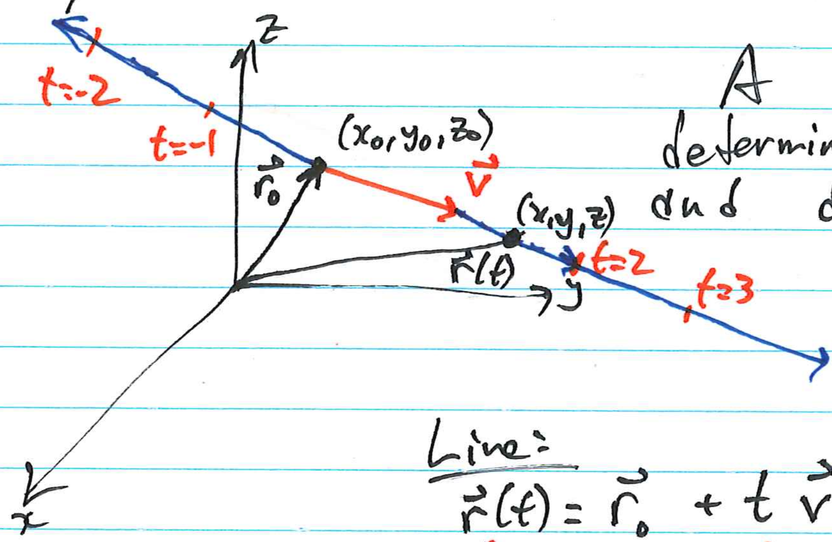
$\Rightarrow \alpha \approx 109°$ // stop, think

$109 + 71 = 180$





Eqns of lines §10.5 and planes §10.6



A $\underline{\text{line}}$ in $\mathbb{R}^3$ is determined by a $\underline{\text{point}}$ and $\underline{\text{direction}}$ $\underline{\text{vector}}$

↳ $\vec{v} = \langle a, b, c \rangle$

identifies with vector $\vec{r}_0 = \langle x_0, y_0, z_0 \rangle$

<u>Line:</u>

$$\vec{r}(t) = \vec{r}_0 + t\,\vec{v}$$

↳ vector from origin to point (x,y,z)

↳ t multiples of $\vec{v}$

<u>Parametric Eqns</u>

$$x(t) = x = x_0 + ta$$
$$y(t) = y = y_0 + tb$$
$$z(t) = z = z_0 + tc$$

<u>Symmetric Form</u> (solve for t)

$$\frac{x - x_0}{a} = \frac{y - y_0}{b} = \frac{z - z_0}{c}$$

<u>Caution:</u> <u>not</u> <u>unique</u> representations of the line.

Ex Find line thru $A = (2,0,3)$
$B = (3,4,0)$

$$(x_0, y_0, z_0) = (2, 0, 3)$$

$$\vec{v} = \overrightarrow{AB} = \langle 1, 4, -3 \rangle$$

So $\underbrace{\dfrac{x-2}{1} = \dfrac{y-0}{4}} = \dfrac{z-3}{-3}$ ⊠

plane

$z + 3x = 9$

Note: $y = 4x - 8$
↳ a plane

So line is the intersection b/w planes.

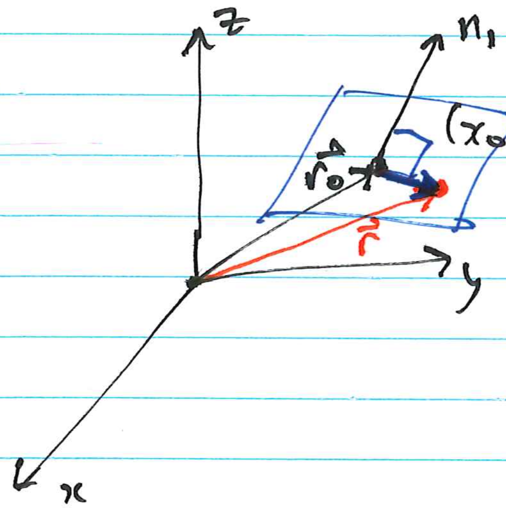
Ex Where does the line above intersect the yz-plane?

$x = 0 \Rightarrow \ldots \Rightarrow y = -8$

$\Rightarrow z = 9$

@ pt $(0, -8, 9)$

Plane determined by a point (x_0, y_0, z_0) and a normal vector $\vec{n} = \langle a, b, c \rangle$



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

$\vec{r}$ corresponds to the point (x, y, z) on the plane.

$$a(x - x_0) + b(y - y_0) + c(z - z_0) = 0.$$