Group Quiz 1
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Math 153

Name: key

No work = no credit

1.) Consider $\vec{u} = \langle 3,1,4 \rangle$ and $\vec{v} = \langle 2,-7,1 \rangle$.

a.) Find $|\vec{u}| = \sqrt{9+1+16} = \sqrt{26}$

b.) Find $\vec{u} \cdot \vec{v} = 6 - 7 + 4 = 3$

c.) Find $\vec{u} \times \vec{v} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 3 & 1 & 4 \\ 2 & -7 & 1 \end{vmatrix} = \langle 29, 5, -23 \rangle$

d.) Find the angle between $\vec{u}$ and $\vec{v}$ $\quad 3 = \sqrt{26} \cdot \sqrt{54} \cos\theta$

$\Rightarrow \theta = \cos^{-1}\left(\frac{3}{\sqrt{26} \cdot 54}\right) \approx 1.49$ rad or 85.41°

2.) Find the parametric equation of the line of intersection of the planes $3x - 2y + z = 1$ and $2x + y - 3z = 3$.

$z = 1 - 3x + 2y$

$\Rightarrow 2x + y - 3(1 - 3x + 2y) = 3$

$\Rightarrow 11x - 5y = 6$

$\Rightarrow y = \frac{11}{5}x + \frac{6}{5}$

$x = 0 \Rightarrow y = \frac{6}{5}$

$\Rightarrow z = \frac{17}{5}$

$x = 5 \Rightarrow y = \frac{61}{5}$

$\Rightarrow z = \frac{52}{5}$

Two points $A\left(0, \frac{6}{5}, \frac{17}{5}\right)$

$B\left(5, \frac{61}{5}, \frac{52}{5}\right)$

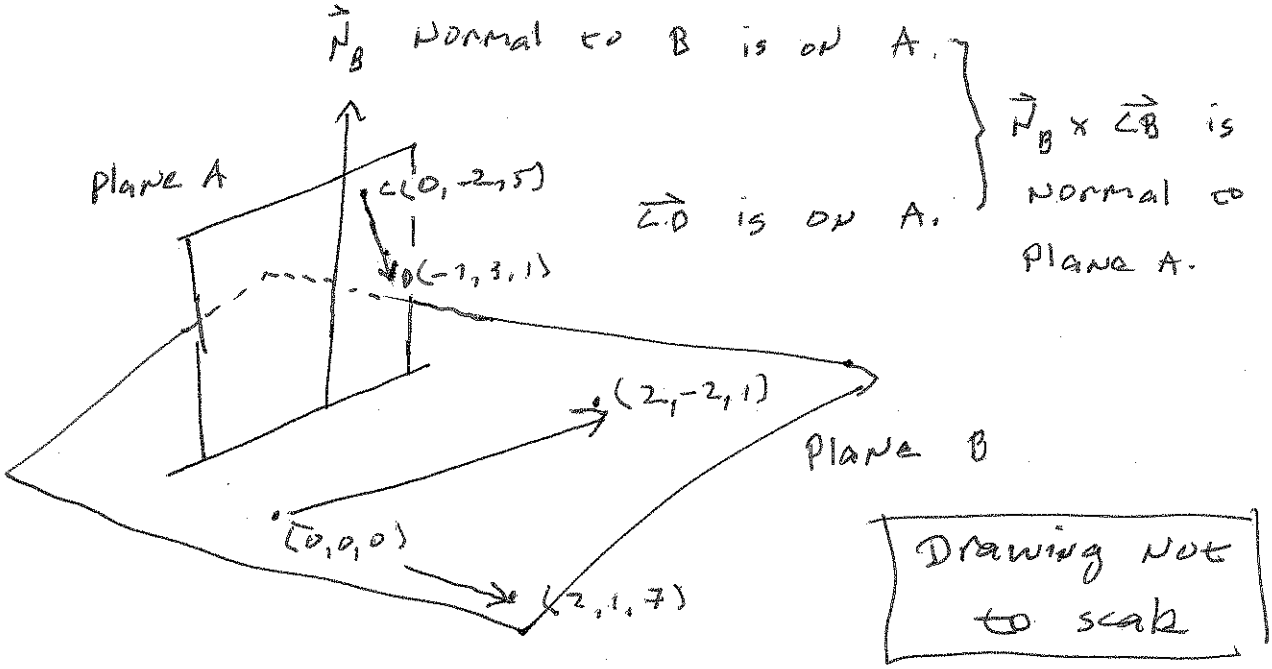
Direction $\vec{AB} = \langle 5, 11, 7 \rangle$

Line:

$x = 0 + 5t, \; y = \frac{6}{5} + 11t, \; z = \frac{17}{5} + 7t$

OR $x = 1 + 5t, \; y = 1 + 11t, \; z = 7t$

3.) Find the equation of plane A that passes through the points $(0,-2,5)$ and $(-1,3,1)$ and is perpendicular to plane B which goes through the points $(0,0,0)$, $(2,1,7)$, and $(2,-2,1)$.



1st: Find $\vec{N}_B$:

$$\langle 2,-2,1\rangle \times \langle 2,1,7\rangle = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 2 & -2 & 1 \\ 2 & 1 & 7 \end{vmatrix} = \langle -15,-12,6\rangle$$

2nd: Find $\vec{CD}$

$$\langle -1,3,1\rangle - \langle 0,-2,5\rangle = \langle -1,5,-4\rangle$$

3rd: Find $\vec{N}_B \times \vec{CD}$

$$\begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ -15 & -12 & 6 \\ -1 & 5 & -4 \end{vmatrix} = \langle 18,-66,-87\rangle$$

4th: The plane,

$$18(x-0) - 66(y+2) - 87(z-5) = 0$$