Name: Key

Calculus 251:C3 **Quiz #4 - 6/1/2020** **Topic: Section 12.5**

Instructions. Answer the questions in the spaces provided or on your own paper, then scan and upload to Canvas. Show and label all of your work. Responses with no work may receive no credit even if the answer is correct.

7 pts

(1) Find an equation of the plane that contains both of the following parameterized lines. You may assume that the two lines intersect.
$\vec{r}_1(t) = \langle 2+2t, 4-2t, -5+t \rangle$
$\vec{r}_2(t) = \langle 7-t, -1+t, -4-2t \rangle$

direction vector for $\vec{r}_1(t)$ is $\vec{v} = \langle 2,-2,1 \rangle$

direction vector for $\vec{r}_2(t)$ is $\vec{w} = \langle -1,1,-2 \rangle$

normal vector for plane

$$\vec{n} = \vec{v} \times \vec{w} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & -2 & 1 \\ -1 & 1 & -2 \end{vmatrix} = \begin{vmatrix} -2 & 1 \\ 1 & -2 \end{vmatrix} \hat{i} - \begin{vmatrix} 2 & 1 \\ -1 & -2 \end{vmatrix} \hat{j} + \begin{vmatrix} 2 & -2 \\ -1 & 1 \end{vmatrix} \hat{k} = 3\hat{i} + 3\hat{j} + 0\hat{k} =$$

so the equation of the plane is $3x + 3y = d$

$\vec{r}_1(0) = \langle 2,4,-5 \rangle$, so $P_0 = (2,4,-5)$ is in the plane

$3(2) + 3(4) = 18$

so the equation of the plane is $\boxed{3x+3y=18}$

$(\text{or } x+y=6)$

3 pts

(3) Determine whether these two planes are perpendicular to each other. Justify your answer.
$\mathcal{P}_1: \; 4x - 3y + 2z = 13$
$\mathcal{P}_2: \; 2x + 2y - z = -5$

$\vec{n}_1 = \langle 4,-3,2 \rangle$

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

$\vec{n}_1 \cdot \vec{n}_2 = 8 - 6 - 2 = 0$

The normal vectors are perpendicular, so the planes are perpendicular.

$\boxed{\text{Yes}}$