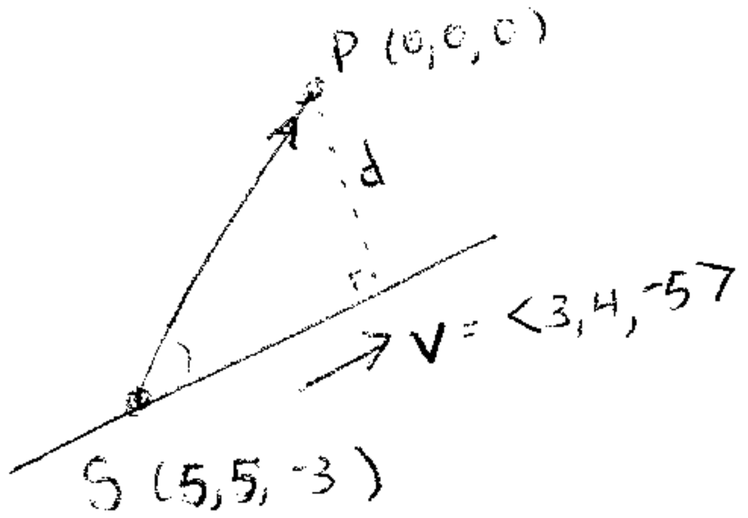
Quiz 6

Name: KEY

Problem 1 (5 points): Find the distance from the point $P(0,0,0)$ to the line

$$x = 5 + 3t$$
$$y = 5 + 4t$$
$$z = -3 - 5t$$



The line passes through S
(put 0 in for t to find this)

$$d = \frac{|\vec{SP} \times v|}{|v|} \qquad \vec{SP} = \langle 5, 5, -3 \rangle$$

$$\vec{SP} \times v = \begin{vmatrix} i & j & k \\ 5 & 5 & -3 \\ 3 & 4 & -5 \end{vmatrix} = i\begin{vmatrix} 5 & -3 \\ 4 & -5 \end{vmatrix} - j\begin{vmatrix} 5 & -3 \\ 3 & -5 \end{vmatrix} + k\begin{vmatrix} 5 & 5 \\ 3 & 4 \end{vmatrix}$$

$$= -13i + 6j + 5k$$

$$d = \frac{|\langle -13, 6, 5 \rangle|}{|\langle 3, 4, -5 \rangle|} = \frac{\sqrt{169 + 36 + 25}}{\sqrt{9 + 16 + 25}} = \frac{\sqrt{230}}{\sqrt{50}} = \sqrt{\frac{23}{5}}$$

Problem 2 (5 points): Find an equation for the plane through $A(7,-3,1)$, $B(5,1,3)$, and $C(9,-4,2)$.

A vector normal to the plane is:

$$\vec{AB} \times \vec{AC} = \begin{vmatrix} i & j & k \\ -2 & 4 & 2 \\ 2 & -1 & 1 \end{vmatrix} = 6i + 6j - 6k = n$$

using the component equation for a plane with $n = Ai + Bj + Ck$

$A(x - x_0) + B(y - y_0) + C(z - z_0) = 0$ and using the point $(7,-3,1)$ we get:

$$6(x - 7) + 6(y + 3) - 6(z - 1) = 0$$