MATH 241 Spring, 2010 Quiz #2 Name: M²

For full credit you must show sufficient work that the method of obtaining your answer is clear.

1. a. Give the vector equation, the parametric equations, and the symmetric equations for the line L through the point P $(2,-1,5)$ that is in the direction of the vector $\mathbf{v} = \langle -1,2,7\rangle$.

vector $\vec{r}(t) = \vec{r}_0 + t\vec{v} = \langle 2,-1,5\rangle + t\langle -1,2,7\rangle$

$$\begin{cases} x = 2-t \\ y = -1+2t \\ z = 5+7t \end{cases}$$

parametric

$t = 2-x$

$t = \dfrac{y+1}{2}$

$t = \dfrac{z-5}{7}$

$2-x = \dfrac{y+1}{2} = \dfrac{z-5}{7}$

$$\boxed{\frac{x-2}{-1} = \frac{y+1}{2} = \frac{z-5}{7}}$$

symmetric

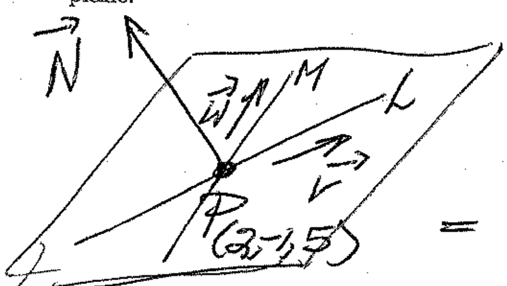
b. Give another point that is on the line. Is the point Q $(3,-3,-2)$ on L or not?

Take e.g. $t=1$; get $(1,1,12)$ on L.

$\dfrac{3-2}{-1} \overset{?}{=} \dfrac{-3+1}{2} \overset{?}{=} \dfrac{-2-5}{7}$ $\quad -1 = -1 = -1$

yes Q is on L.

2. Give a single equation in (x,y,z) coordinates for the plane through the point P above that contains the line L above and also contains the line M through P in the direction of $\mathbf{w} = \langle 1,-3,7\rangle$. Also give parametric equations for this plane.



$\vec{r} = \vec{r}_0 + t\vec{v} + s\vec{w}$

Use

$\vec{N} = \vec{v} \times \vec{w}$

$= \langle -1,2,7\rangle \times \langle 1,-3,7\rangle$

$= \langle 14+21, 7+7, 3-2\rangle$

$= \langle 35, 14, 1\rangle$

Check $\vec{N}\cdot\vec{v} = -35+28+7 = 0$

$\vec{N}\cdot\vec{w} = 35-42+7 = 0$

$35(x-2) + 14(y+1) + z-5 = 0$

$$\boxed{35x + 14y + z = 70-14+5 = 61}$$

$$\begin{cases} x = 2-t+s \\ y = -1+2t-3s \\ z = 5+7t+7s \end{cases}$$

parametric