Spring 2010

1) a) Find parametric equations for Line L containing $M=(1,-2,3)$ & $N=(4,0,2)$

$\overrightarrow{MN} = (4,0,2) - (1,-2,3) = \langle 3, 2, -1 \rangle$

$x = \boxed{3t} + \boxed{4}$
$y = \boxed{2t} + \boxed{0}$
$z = \boxed{-1t} + \boxed{2}$

direction vector — point on line

b) Find an equation for the plane P through $A=(0,0,1)$, $B=(2,0,-1)$, and $C=(3,3,0)$. An equation for the plane is _____.

$\overrightarrow{AB} = (2,0,-1) - (0,0,1) = \langle 2, 0, -2 \rangle$

$\overrightarrow{AC} = (3,3,0) - (0,0,1) = \langle 3, 3, -1 \rangle$

Find Normal $\overrightarrow{AB} \times \overrightarrow{AC} = \begin{vmatrix} i & j & k \\ 2 & 0 & -2 \\ 3 & 3 & -1 \end{vmatrix} = -(3)(-2)i - [(2)(-1) - (3)(-2)]j + (2)(3)k$

$6i - 4j + 6k$

$\vec{N} = \langle 6, -4, 6 \rangle$

$6(x-0) - 4(y-0) + 6(z-1) = 0$

$\boxed{6x - 4y + 6(z-1) = 0}$

c) The Line L & the plane P intersect. Find the coordinates for the point of intersection.

Plane P: $6x - 4y + 6z = 6$, $3x - 2y + 3z = 3$

Line L: $x = 3t+4$, $y = 2t+0$, $z = -1t+2$

$3(3t+4) - 2(2t) + 3(-1t+2) = 3$

$9t + 12 - 4t - 3t + 6 = 3$

$2t = -15$

$t = \frac{-15}{2}$

$x = 3(-15/2) + 4$
$y = 2(-15/2)$
$z = -(-15/2) + 2$

The point of intersection is $\left(\frac{-37}{2}, -15, \frac{19}{2}\right)$.

d) Are L & P perpendicular? Briefly explain the reason for ~~the~~ your answer.

$\langle 2, 0, -2 \rangle \cdot \langle 3, 2, -1 \rangle = 6 + 0 + 2 = 8$

$8 \neq 0$

Therefore L & P are not perpendicular.