MATH 202 Name : SOLUTIONS
Quiz 3 September 28, 2009

Instructions: You get one point for taking this quiz.

1. Consider the planes given by equations:

$$2x - y + z = 2 \leftarrow \text{Plane 1}$$
$$x + 2y - 3z = 0 \leftarrow \text{Plane 2}$$

(a) (1 pt.) Explain why these planes are *not* parallel.

The normal vectors $\vec{n}_1 = (2,-1,1)$ and $\vec{n}_2 = (1,2,-3)$ are not parallel i.e. are not scalar multiples of one another.

(b) (2 pts.) Give the vector equation for the line of intersection of the two planes.

We need a point P and a direction vector $\vec{v}$ for the line of intersection.

For P: Set one coordinate $= 0$ and solve.

$$x=0 \Rightarrow \begin{cases} -y+z=2 \\ 2y-3z=0 \end{cases} \quad \text{with solution } y=-6 \quad z=-4$$

$P(0,-6,-4)$

For $\vec{v}$: compute $\vec{v} = \vec{n}_1 \times \vec{n}_2$

$$\vec{v} = \begin{vmatrix} \hat{\imath} & \hat{\jmath} & \hat{k} \\ 2 & -1 & 1 \\ 1 & 2 & -3 \end{vmatrix} = [(-1)(-3)-(1)(2)]\hat{\imath} - [(2)(-3)-(1)(1)]\hat{\jmath} + [2(2)-(-1)(1)]\hat{k}$$
$$= 1\hat{\imath} + 7\hat{\jmath} + 5\hat{k} = (1,7,5)$$

The equation of the line of intersection is: $\vec{p} + t\vec{v} \quad t \in \mathbb{R}$

OR $\boxed{(0,-6,-4) + t(1,7,5) \quad t \in \mathbb{R}}$

2. Give the equation of the plane passing through the point $P(-1, 2, 1)$ and *orthogonal* to the plane $2x + y + z = 3$.

#2. Challenge:
This is a bad question. (Actually, it has a typo.)
A good question is:

Give the equation of the line passing through $P(-1,2,1)$ and orthogonal to the plane $2x+y+z=3$.

We will discuss this in class.