

Math 173 - Quiz 3

February 2, 2012

Name key

Score _____

Show all work to receive full credit. Supply explanations when necessary.

1. (3 points) Find a set of symmetric equations for the line passing through the points (5, 2, 3) and (7, -1, 3).

$$\vec{v} = (7-5)\hat{i} + (-1-2)\hat{j} + (3-3)\hat{k} = 2\hat{i} - 3\hat{j}$$

Using (5, 2, 3)...

$$\frac{x-5}{2} = \frac{y-2}{-3}, z=3$$

2. (1 point) Find a unit vector normal to the plane $-2x + 3y - 5z = 10$.

NORMAL VECTOR IS $-2\hat{i} + 3\hat{j} - 5\hat{k}$

$$\vec{N} = \frac{-2\hat{i} + 3\hat{j} - 5\hat{k}}{\sqrt{4+9+25}} = \frac{1}{\sqrt{38}}(-2\hat{i} + 3\hat{j} - 5\hat{k})$$

3. (3 points) Find an equation of the plane passing through the points $P(2, 0, 3)$, $Q(1, -1, 5)$, and $R(-3, -2, 1)$.

$$\vec{PQ} = -\hat{i} - \hat{j} + 2\hat{k}$$

$$\vec{PR} = -5\hat{i} - 2\hat{j} - 2\hat{k}$$

$$\vec{N} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ -1 & -1 & 2 \\ -5 & -2 & -2 \end{vmatrix} = \hat{i}(2+4) - \hat{j}(12) + \hat{k}(-3)$$

$$\vec{N} = 6\hat{i} - 12\hat{j} - 3\hat{k}$$

$P(2, 0, 3)$

$$6(x-2) - 12(y-0) - 3(z-3) = 0$$

or $6x - 12y - 3z = 3$

4. (3 points) The line l , whose parametric equations are given below, does not cross through the plane $3x + 5y - z = 5$. Find the distance from the line to the plane.

$$l: x=t+1, y=t+2, z=8t+3$$

WE NEED TO COMPUTE THE DISTANCE FROM THE PLANE TO ANY POINT ON THE LINE.

LET'S USE (1, 2, 3)

AS OUR POINT ON THE LINE

$$\text{DISTANCE} = \frac{|3(1) + 5(2) + (-1)(3) - 5|}{\sqrt{9 + 25 + 1}}$$

$$= \frac{5}{\sqrt{35}} \approx 0.845$$