MATH 280 – QUIZ #1 **Name:** 1&M

Directions: Please show all work to receive maximum credit. This quiz is worth 14 points.

1. Given $\vec{a}=\langle 2,4,-3\rangle$ and $\vec{b}=\langle 1,-3,2\rangle$. Determine the following:

(2 points) a. $\vec{a}\cdot\vec{b}$ $= 2-12-6 = -16$

(1 point) b. $5\vec{a}+3\vec{b}$ $= 5\langle 2,4,-3\rangle + 3\langle 1,-3,2\rangle$

$= \langle 10, 20, -15\rangle + \langle 3,-9,6\rangle$

$= \langle 13, 11, -9\rangle$

(2 points) c. $\text{proj}_{\vec{a}}\vec{b}$ $= \dfrac{\vec{a}\cdot\vec{b}}{|\vec{a}|^2}\langle 2,4,-3\rangle$ $|\vec{a}| = \sqrt{4+16+9} = \sqrt{29}$

$\dfrac{-16}{29}\langle 2,4,-3\rangle$

$= \left\langle \dfrac{-32}{29}, \dfrac{-64}{29}, \dfrac{48}{29}\right\rangle$

(2 point) d. The area of the parallelogram determined by $\vec{a}$ and $\vec{b}$.

$$\vec{a}\times\vec{b} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & 4 & -3 \\ 1 & -3 & 2 \end{vmatrix} = \hat{i}(8-9) - \hat{j}(4+3) + \hat{k}(-6-4)$$

$$= -1\hat{i} - 7\hat{j} - 10\hat{k}$$

$|\vec{a}\times\vec{b}| = \sqrt{1+49+100} = \sqrt{150} = \sqrt{25\cdot 6} = 5\sqrt{6}$ sq units

(3 points) 2. Find the parametric form of the equation of a line that passes through the points $P(4,8,-7)$ and $Q(-1,5,6)$.

$\vec{PQ} = \langle -5, -3, 13 \rangle$

$x = 4 - 5t$

$y = 8 - 3t$

$z = -7 + 13t$

(4 points) 3. Find the equations of the plane that passes through the points $P(3,2,-5)$, $Q(4,3,6)$, and $R(1,-3,2)$.

$\vec{PQ} = \langle 1, 1, 11 \rangle$

$\vec{PR} = \langle -2, -5, 7 \rangle$

$$\vec{PQ} \times \vec{PR} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & 1 & 11 \\ -2 & -5 & 7 \end{vmatrix} = \hat{i}(7+55) - \hat{j}(7+22) + \hat{k}(-5+2)$$

$$= 62\hat{i} - 29\hat{j} - 3\hat{k}$$

$62(x-3) - 29(y-2) - 3(z+5) = 0$

$62x - 186 - 29y + 58 - 3z - 15 = 0$

$62x - 29y - 3z - 143 = 0$