**Math 253 Calculus III Fall 2018** **Quiz # 2, 12 Sept 2018**

**Name:** _____

There are 20 points possible on this quiz. This is a closed book quiz and closed note quiz. Calculators are not allowed. If you have any questions, please raise your hand.

1. (6 points) Given points $P(0, -2, 0),\ Q(4, 1, 2)$, and $R(5, 3, 1)$ in $\mathbb{R}^3$. Answer the questions below.

   (a) Find a nonzero vector orthogonal to the plane through points $P$, $Q$, and $R$.

   (b) Find the area of triangle $PQR$.

2. (6 points) Find equations (parametric, vector, or symmetric) for the line through the point $P(-2, 5, 8)$ and parallel to line $L_2$ with parametric equations: $x = 3 - 2t,\ y = 4t,\ z = 9$.

3. (6 points) Find an equation of the plane that contains the line $\vec{r}(t) = \langle -1, 1, 0\rangle + t\langle 3, 2, -2\rangle$ and is parallel to the plane $z = 3 - 6x + y$.

4. (2 points) State whether each expression is meaningful. If not, explain why. If so, state whether it is a vector or a scalar.

   (a) $(\vec{a} \times \vec{b}) \times \vec{c}$

   (b) $(\vec{a} \cdot \vec{b}) \times (\vec{c} \cdot \vec{d})$