Math 2110Q Practice Midterm-I Name: _____

1. (10 pts) Consider $P(1,6,-5)$, $Q(2,5,-3)$, $R(4,3,1)$. Determine whether the three points P, Q, R are colinear.

2. (10 pts) Assume that a line ℓ is in the direction of $(3,0,-4)$. Compute the distance between the line ℓ and the point $P(0,2,6)$.

3. (10 pts) Find the area of the triangle whose sides are $\mathbf{u} = (3,3,3)$, $\mathbf{v} = (6,0,6)$, and $\mathbf{u} - \mathbf{v}$.

4. (10 pts) Find an equation of the line passing through $(0,4,8)$ and $(10,-5,-4)$.

5. (10 pts) Find the unit tangent vector of the curve $\mathbf{r}(t) = (\sin t, \cos t, \cos t)$.

6. (10 pts) A projectile is fired over horizontal ground from the origin with an initial speed of 60 m/s. What firing angles will produce a range of 300 m?

7. (10 pts) Find the length of the curve $\mathbf{r}(t) = (4\cos t, 4\sin t, 3t)$ for $0 \leq t \leq 4\pi$.

8. (10 pts) Find the arc length parameterization of the curve $\mathbf{r}(t) = (\cos t^2, \sin t^2)$ for $0 \leq t \leq \sqrt{\pi}$.

9. (10 pts) Consider the planes $Q : x + 2y - z = 1$ and $R : x + y + z = 1$. Find an equation of the line where the planes Q and R intersect.

10. (10 pts) Is the function $f(x,y) = \dfrac{x^2y^2}{x^4 + y^2}$ continuous at $(0,0)$. Justify your answer.