Math 3330 - Test 1.1

Name:_____

No calculators and show all work.

1. Define the function parmaterically: $x = 2\cos(3t^2)$ and $y = 3\sin(3t^2)$. Find the equation of the tangent line at $t = \sqrt{\pi/4}$.

2. Find the arclenth from $t = 0$ to $t = 3$ for the function given paramtrically as:
   $x = \cos(e^{2t})$ and $y = \sin(e^{2t})$

3. Graph the function $r = 2 + \sin(\theta)$.

4. Find the area inside $r = \sqrt{2+\theta}$ from $\theta = \pi/2$ to $\theta = 3\pi/2$.

5. Graph the equation $1 = \frac{z^2}{3} + \frac{x^2}{4}$ in $\mathbb{R}^2$ and in $\mathbb{R}^3$.

6. Prove $(\mathbf{v} \cdot \mathbf{w})^2 + (\mathbf{v} \times \mathbf{w})^2 = \|\mathbf{v}\|^2 \|\mathbf{w}\|^2$

7. Do the following.

   (a) Find a parametric equation for the circle $x^2 + y^2 = 8$.

   (b) Let $\mathbf{v_1} = \langle 1, 1, 2 \rangle$ and $\mathbf{v_2} = \langle 1, -3, 7 \rangle$. The vectors $\mathbf{v_1}$ and $\mathbf{v_2}$ form a parallelogram. Find its area.

8. Define the points $P(1, 0, 1)$, $Q(1, -1, 0)$ and $R(11, 2, -1)$.

   (a) Find the equation of the plane through the points P, Q and R.

   (b) Find the angle between the planes $x = y - z$ and $x + 2y = 7$.

   (c) Find the equation of a line contained within the plane $x = y - z$.

9. For the equation $z^2 = x^2+y^2$ produce the level curves for $z = -1, 0, 1, 2$ and the level curve for $x = 0$. And then graph the equation in $\mathbb{R}^3$. Is your graph a function?