MATH 3330 Test 1 Version 2

Name:_____

1. Find the tangent line for the function given parametrically as

$$x = t^2 + t^4 + 3, y = t^3 + t + 4,$$

at $t = 1$.

2. Graph $r = \sin(2\theta)$

3. Find the area inside of the spiral $r = \sqrt{e^{\theta} + 1}$ from $\theta = 0$ to $\theta = \pi$.

4. Consider the lines

$$L_1 : x = 2 + t,\ y = t - 1,\ z = 3$$

$$L_2 : x = 4t,\ y = 2 - 4t,\ z = 3t$$

and the plane

$$P_1 : 2x + y - z = 14$$

(a) Are the lines $L1$ and $L2$ parallel? Why or why not?

(b) Find the intersecting point between $L1$ and plane $P1$. State your point as (x, y, z).

(c) What is the angle between $L1$ and plane $P1$?

5. Define the three points $P(1, 2, 3)$, $Q(4, 5, 6)$ and $R(0, 5, 6)$.

   (a) Find the normal equation of the plane that contains P, Q and R.

   (b) What is the area of the triangle with vertices P, Q and R.

6. Graph the level curves $z = -1, 0, 1, 2$ and the level curve $x = 0$. Also graph the function in $\mathbb{R}^3$.

$$z = \frac{x^2}{4} + y^2$$

7. Do **one** of the following problems

   - For the specific vectors $\mathbf{v} = \langle 1, 2, 3 \rangle$ and $\mathbf{w} = \langle 1, -2, 3 \rangle$, find
     - the vectors $\mathbf{v} + \mathbf{w}$ and $\mathbf{v} - \mathbf{w}$,
     - find the area in the parallelogram formed by $\mathbf{v}+\mathbf{w}$ and $\mathbf{v}-\mathbf{w}$.
     - Find the area in the parallelogram formed by $\mathbf{v}$ and $\mathbf{w}$.
     - Conjecture something about the two previous answers.

   - For the general vectors $\mathbf{v}$ and $\mathbf{w}$ in $\mathbb{R}^3$, prove

     $$(\mathbf{v} + \mathbf{w}) \times (\mathbf{v} - \mathbf{w}) = 2\,\mathbf{v} \times \mathbf{w}$$

     .

ec. Take this question home. Write a paper on Piet Hein and the super ellipse. Due Monday Oct 17th.