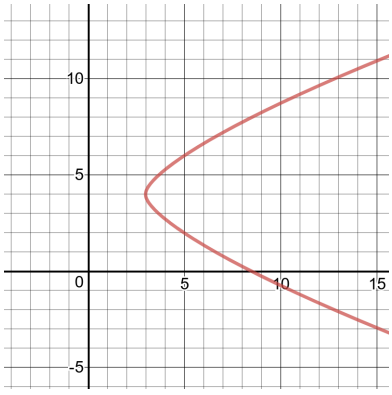
MATH 3330 Test 1

Name:_____

1. Find the equation of the line tangent to the graph

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

at the time $t = 1$. Also sketch your tangent line on the graph below



2. Graph $r = 3\cos(\theta) + 2$

3. Find the area inside of the spiral $r = 3 + \theta$ from $\theta = 0$ to $\theta = \pi/4$.

4. Define the three points $P(1,0,2)$, $Q(-1,1,0)$ and $R(1,2,2)$ and the vectors $\mathbf{v} = \langle 1,2,2 \rangle$, $\mathbf{w} = \langle 1,2,3 \rangle$ and $\mathbf{u} = \langle 0,0,1 \rangle$.

   (a) Find a unit vector parallel to $\vec{PQ}$.

   (b) Find the equation of a line that contains P and R.

   (c) Find the equation of the line that contains P and Q.

   (d) What is the angle between the lines you found in Problem 4b and Problem 4c.

5. Define the three points $P(-1, 1, -1)$, $Q(0, 1, 0)$ and $R(1, 2, 2)$ and the vectors $\mathbf{v} = \langle 1, 2, 2 \rangle$, $\mathbf{w} = \langle 1, 2, 3 \rangle$ and $\mathbf{u} = \langle 0, 0, 1 \rangle$.

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

   (b) Find the angle between the vectors $\mathbf{v}$ the plane $3x - z = 2$.

   (c) Find the volume of the parallelepiped formed by vectors $\mathbf{v}$, $\mathbf{w}$ and $\mathbf{u}$.

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

$$z^4 = x^2 + y^2$$

TAKE HOME Use your skills to graph the following in the first quadrant.

1. $x^1 + y^1 = 1$
2. $x^2 + y^2 = 1$
3. $x^3 + y^3 = 1$
4. $x^4 + y^4 = 1$
5. $x^10 + y^10 = 1$
6. $x^\infty + y^\infty = 1$

Look up Piet Hein and explain the super ellipse to me. Write a one pae paper (in addition to the above graphs) about Piet Hein and the super ellipse or squircles or anything else on those subjects that interest you. Remember to cite your sources.