Math 3330 - Test 1

Name:_____

1. Define parametrically $\begin{aligned} x &= 3\cos(t) \\ y &= 3\sin(t). \end{aligned}$

   (a) Graph it.

   (b) Compute the equation of the tangent line at $t = \pi/4$.

2. Define in polar coordinates $r = 3\cos(\theta)$.

   (a) Graph it.

   (b) Compute the equation of the tangent line at $\theta = \pi/4$.

3. Define in polar coordinates $r = \sqrt{3\cos(\theta)}$. I have graphed it for you. You should compute the area for me.

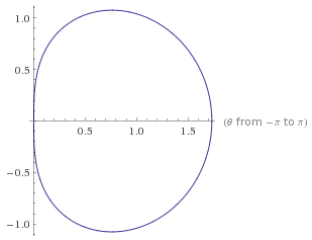

Figure 1: $r = \sqrt{3\cos(\theta)}$

4. Let $\mathbf{w_1} = \langle 1, 2 \rangle$ and $\mathbf{w_2} = \langle -5, 3 \rangle$.

   (a) Sketch $\mathbf{w_1}$ and $\mathbf{w_2}$.

   (b) Compute and sketch $\mathbf{Proj_{w_2} w_1}$.

5. Let $\mathbf{v_1} = \langle 1, 0, -2 \rangle$, $\mathbf{v_2} = \langle 1, 1, 5 \rangle$ and $\mathbf{v_3} = \langle 0, 2, 1 \rangle$.

   (a) What is the angle between $\mathbf{v_1}$ and $\mathbf{v_2}$.

   (b) Compute volume of the parallepiped formed by $\mathbf{v_1}$, $\mathbf{v_2}$ and $\mathbf{v_3}$.

6. Find the following.

   (a) Find the equation of a plane containg the three points $P(1, 2, 3)$, $Q(0, 2, -1)$ and $R(0, 4, 4)$.

   (b) Compute the eqaution of the line that is the intersection of the two planes.

$$P_1 : x - 2y + z = 1 \text{ and } P_2 : x + 2y + 3 = 4$$

7. Let $z = x^2 + 2y^2$.

   (a) Graph the trace curves $z = -1, 0, 1, 2$ and $x = 0$.

   (b) Graph.

Extra Credit Take Home:

Recently I have become aqcainted with this new thing called the world wide web (www). Many of you may have heard of it too. There are all sorts of neat things on it. I lke to use a search engine to find my way around the www. My favorite search engine is

duckduckgo.com

I have heard of others as well. But one of the reasons I like duckduckgo.com is because of its ability to do mathematics (of course). For example

1. To graph $y = x^2$, I only need to search (notice the funny !wa at the end)

$$Plot[x^2, \{x, -1, 1\}] \; !wa$$

2. To graph $z = x^2 + y^2$, I only need to search

$$Plot3d[x^2 + y^2, \{x, -1, 1\}, \{y, -1, 1\},] \; !wa$$

3. And to graph $x^2 + y^2 + z^2 = 1$, I only need to search (well this only plots the upper half plane).

$$Plot3D[(1 - x^2 - y^2)^(1/2), \{x, -1, 1\}, \{y, -1, 1\}] \; !wa$$

Use duckduckgo (or other graphing resources like Maple on the computers in the NAB 109 and NAB111) to graph $x^\infty + y^\infty = 1$ and $x^0 + y^0 = 1$. Well maybe won't graph these directly; let's try the following:

1. First graph $x^2 + y^2 = 1$, $x^4 + y^4 = 1$ and $x^8 + y^8 = 1$ and predict what $x^\infty + y^\infty = 1$ will look like.

2. Now graph $x^2 + y^2 = 1$, $|x|^1 + |y|^1 = 1$, $|x|^{1/2} + |y|^{1/2} = 1$, and $|x|^{1/10} + |y|^{1/10} = 1$. Use these to predict what $x^0 + y^0 = 1$ will look like.

I would like you to graph $x^\infty + y^\infty = 1$, $x^2 + y^2 = 1$, $|x|^1 + |y|^1 = 1$ and $x^0 + y^0 = 1$. Of course my favorite graph is $|x|^{0.57} + |y|^{0.57} = 1$ Please graph this as well.