University of Lethbridge
Department of Mathematics and Computer Science
MATH 2565 - Tutorial #12
Thursday, April 5

Name:_____

Note: You may do this assignment as a group, if you wish, by listing additional names under the space above, up to a maximum of 3 students per group.

Extra practice:

1. Plot the polar function:
   (a) $r = 2 + \cos\theta$, $\theta \in [0, 2\pi]$
   (b) $r^2 = \cos(2\theta)$, $\theta \in [-\pi/4, \pi/4] \cup [3\pi/4, 5\pi/4]$
2. Find the points of intersection of the polar curves. (Note that the point $(0, 0)$ requires special care: you might have $r = 0$ for *different* values of θ for the two curves.)
   (a) $r = \cos(2\theta)$ and $r = \cos\theta$, on $[0, 2\pi]$
   (b) $r = \sin\theta$ and $r = \sqrt{3} + 3\sin\theta$, on $[0, 2\pi]$
3. Compute the area:
   (a) One loop of the three-leaf rose $r = \sin(3\theta)$.
   (b) The outer loop of the limaçon $r = 1 + 2\cos\theta$.

1. Plot the given polar function:

   (a) $r = \cos(2\theta)$, $\theta \in [0, 2\pi]$.

   (b) $r = 2\cos(\theta)$, $\theta \in [-\pi/2, \pi/2]$

2. Find the given area:

   (a) Inside the circle $r = 2\cos\theta$, but outside the circle $r = 2\sin\theta$.

   (b) The area common to the inside of the curves $r = \cos\theta$ and $r = \sin(2\theta)$, in the first quadrant.

3. Show that the indicated limit does not exist:

   (a) $\lim_{(x,y)\to(0,0)} \dfrac{3x+4y}{x-2y}$

   (b) $\lim_{(x,y)\to(0,0)} \dfrac{xy^4}{x^2+y^8}$

4. What geometric object is obtained as the graph of $f(x,y) = 2x - 3y$?

5. *Challenge:* Describe the level surfaces of $f(x,y,z) = k$ $f(x,y,z) = x^2 + y^2 - z^2$, for $k = -2, -1, 0, 1, 2$.