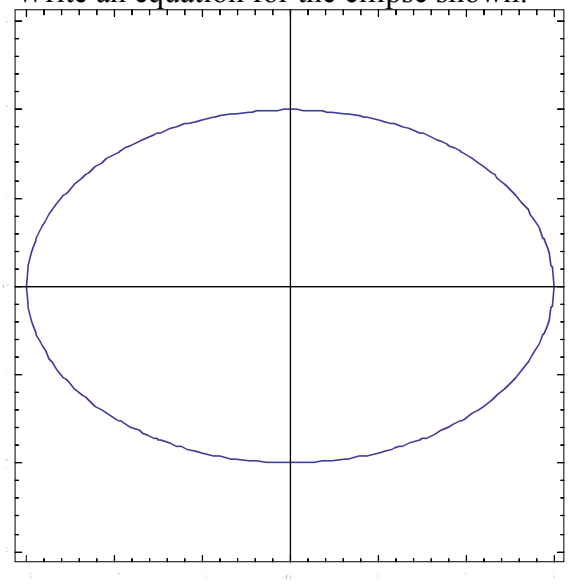
Exam 3 Calc 2 4/22/2016

Each problem is worth 10 points. For full credit provide complete justification for your answers.

1. Write an equation for the ellipse shown:



2. a) Convert the point with rectangular coordinates (5,5) into polar form.

   b) Convert the point with rectangular coordinates (0,3) into polar form.

   c) Convert the point with rectangular coordinates (0,3) into a different polar form than you gave in part b.

   d) Convert the point with polar coordinates $(2,\pi/2)$ into rectangular form.

   e) Convert the point with polar coordinates $(1,3\pi/4)$ into rectangular form.

3. Use separation of variables to find a general solution to the differential equation $2y' + 5y = 4$.

4. Consider the parametric curve $c(t) = (t^3 + t, t^2 - 1)$. Calculate dy/dx at the point where $t = 3$.

5. Find an equation for the hyperbola with vertices $(\pm 8,0)$ and asymptotes $y = \pm \frac{3}{4} x$.

6. Biff is a calculus student at Enormous State University, and he has a question. Biff says "Dude, I love these parametric things, 'cause it's like all you gotta do is have your calculator graph 'em, you know? But for this one I think it screwed up somehow, 'cause it's $x = 3\cos t$ and $y = 3\sin t$, but the graph comes up like kind of a circle. That can't be right, 'cause trig stuff is all wavy, right?"

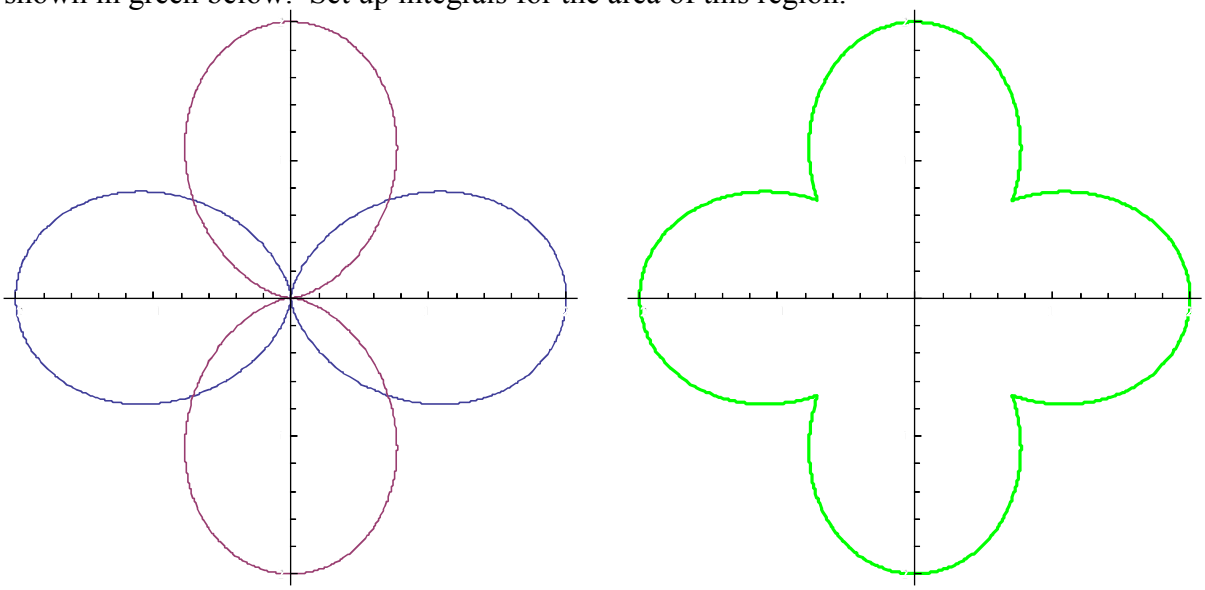
   Help Biff by explaining what's going on.

7. Consider the ellipse given by $c(t) = (3\cos t, 2\sin t)$. Set up an integral for the length of the first-quadrant portion of this curve.

8. Consider the ellipse given by $c(t) = (3\cos t, 2\sin t)$. Find the area of the region inside it.

9. Consider the family of parametric curves given by $x = at^2$ and $y = t^3 - 3t$. For which value(s) of a will the curve be perpendicular to itself at the point where it crosses itself?

10. For Earth Day, Jon is making a large green sign whose outline will be the region inside at least one of the curves $r = 1 + \cos 2\theta$ and $r = 1 - \cos 2\theta$ (with units in meters), so the region shown in green below. Set up integrals for the area of this region.



Extra Credit (5 points possible):
Evaluate your integrals from #10.