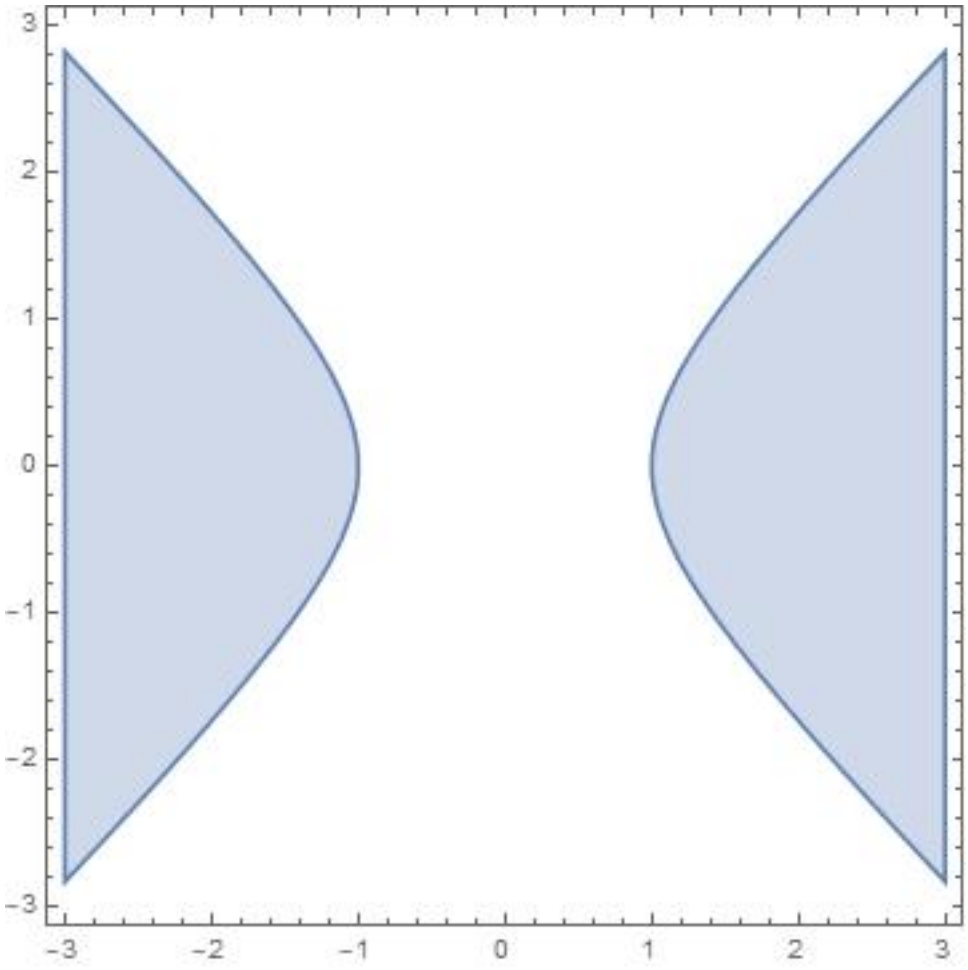
Exam 4 **Calculus 2** **4/26/19**

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

1. Convert the point with rectangular coordinates $(0, 4)$ to polar coordinates (r, θ).

2. Consider the curve defined by the parametric equations $x(t) = t^2 - 1$ and $y(t) = t^2 - t$. Find the slope of this curve at the point $(0, 0)$.

3. Find an equation for the hyporbola shown:



4. Consider the curve defined by the parametric equations $x = t^3 - 7t$ and $y = 8t^2$. Set up an integral for the length of the loop of this curve.

5. Set up an integral for the area bounded by the curve with polar equation $r = 2\sin(3t)$.

6. Identify the graph of $y^2 - 8y = 16x^2$ as a parabola, hyperbola, or ellipse, give coordinates of its vertices, and sketch a decent graph.

7. Bunny is a Calculus student at Enormous State University, and she's having some trouble. Bunny says "Ohmygod. Ohmygod. This is just so confusing. I got all the answers to our homework problems from the online thingy, right? Where they have, like, all the answers for problems in the whole book, right? But then on our exam nothing went right, which is totally unfair, right? But so what I really need to know, like for the final, is for the rose things, like the r is cos 5 theta or 6 theta or something, how do you even know if your limits are to pi or to 2pi? Because in the online answers, it's like, both ways, right?"

   Help Bunny out by explaining how to tell whether a limit of π or 2π is appropriate for problems of this sort.

8. Find the area of the region which is inside the polar curve

$$r = 4\cos(\theta)$$

and outside the curve

$$r = 3 - 2\cos(\theta)$$

9. Find the exact (x, y) coordinates of the highest point(s) on the curve with polar equation $r = 1 - 2\sin\theta$.

10. An ellipse can be expressed with the parametric equations

$$x(t) = a\cos t$$

$$y(t) = b\sin t$$

Set up an integral for the area bounded by the ellipse.

Extra Credit [5 points possible]: Evaluate the integral from #10.