Test 3   Sum II, 2011 Name:_____
MAT 162   Gurganus

Directions: Show all work for partial credit purposes. You may use a graphing
calculator. Otherwise the test is closed book.

1. For the parametric curve, $x = 2t^3$, $y = t^2 - t$, $-2 \le t \le 2$:

   (a) Calculate the following: $\dfrac{dx}{dt}$, $\dfrac{dy}{dt}$, $\dfrac{dy}{dx}$, and $\dfrac{d^2 y}{dx^2}$.

   (b) Tell when x is increasing. Tell when y is decreasing. Tell when $y = f(x)$ is
        concave up.

   (c) Tell where $y = f(x)$ has a horizontal tangent line. Are there any vertical tangent
        lines.? If so, where?

   (d) Sketch the graph of the parametric curve in the xy plane for $-2 \le t \le 2$.

   (e) Write down, but do not evaluate the integral of the length of the curve.

2. (a) Sketch the polar graph of $r = 1 - \sin(\theta)$ from $\theta = 0$ to 2π..

(b) Find the area between the curve and the origin.

(c) Write down, but do not evaluate the integral of the length of this curve.

3. For $25x^2 + 16y^2 - 150x + 64y - 111 = 0$,
   (a) Identify the conic section.

(b) Find the center.

(c) Find the vertices.

(d) Find the foci.

(e) Find the eccentricity.

(f) Sketch the curve in the xy plane.

4. (a) Rewrite the polar equation $r = \dfrac{3}{2 + 2\sin(\theta)}$ using xy coordinates.

(b) Calculate the eccentricity, center, foci, and vertices of the curve.

(c) Sketch the graph of $r = \dfrac{3}{2 + 2\sin(\theta)}$.