Name:_____ **Due: 5/21/2015**

Math 202 Quiz 4

Directions Answer all questions in the space provided and box your final answers. Good luck!

1. Consider the curve described by the following parametric equations.

$$x = t^3 - 12t$$

$$y = t^2 - 1$$

(a) (8 points) Find $\dfrac{dy}{dx}$ as a function of t.

(b) (8 points) Find $\dfrac{d^2y}{dx^2}$ as a function of t.

2. Sketch the following polar curves.

(a) (4 points) $r = 2\cos(3\theta)$

(b) (4 points) $r = 3\cos(2\theta)$

(c) (4 points) $r = \dfrac{1}{2} + \sin(\theta)$

3. (8 points) Find the slope of the tangent line to the polar curve $r = \dfrac{1}{\theta}$ when $\theta = \pi$.

4. (8 points) Find the area of the region inside the polar curve $r = 3\cos\theta$ and outside the polar curve $r = 1 + \cos\theta$.

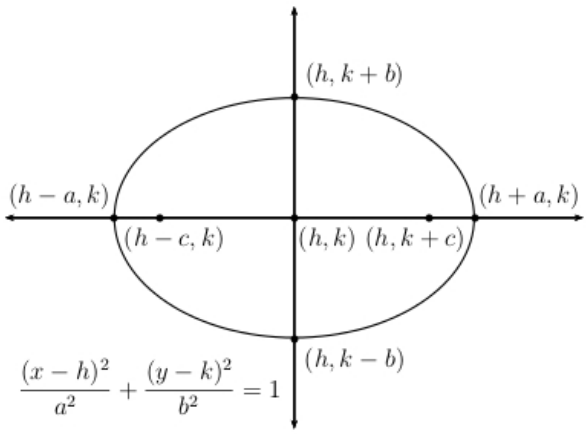

Figure 1: An ellipse with $a > b$

Recall that an equation of the form

$$\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1, \quad a > b$$

describes an ellipse with center (h, k), major axis a, and minor axis b. The center lies on the major axis (horizontal) exactly between the vertices and foci, which lie on the major axis at the points $(h \pm a, k)$ and $(h \pm c, k)$ respectively, where $c^2 = a^2 - b^2 > 0$.

Note that if $b > a$, then the major axis is vertical (rotate the figure 90°), and the vertices and foci lie at the points $(h, k \pm b)$ and $(h, k \pm c)$ respectively, where $c^2 = b^2 - a^2 > 0$.

5. (8 points) Give an equation for the ellipse with foci at $(-1, -3)$ and $(-1, 5)$ and a vertex at $(-1, -4)$.