M182 Section 02 – Calculus II, Summer 2002 Name:_____
Exam II Thursday, July 23, 2002

Seven problems, 100 points total.

> "Most of the important things in the world have been accomplished by people who have kept on trying when there seemed to be no hope at all." - Dale Carnegie.

Show all work. Unjustified answers will receive zero credit.

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1. (10 points) Consider the curve defined by $y^2 = x^3$.

   (a) Verify that the points $(0, 0)$ and $(\frac{4}{3}, \frac{8\sqrt{3}}{9})$ are both on the curve.

   (b) Calculate the arc length of the portion of the curve between the two points.

2. (15 points) Match each of the following parametric curves (a) - (e) with exactly one of the descriptions listed to the right. (Some descriptions may apply to more than one curve, and some descriptions may apply to none of the curves. You need not show your work for this problem.)

   _____ (a) $x = \cos t,\ y = \cos^2 t$

   _____ (b) $x = t^3,\ y = t^6$

   _____ (c) $x = \sin 2t,\ y = -\cos 2t$

   _____ (d) $x = 2t - 3,\ y = 3t + 2$

   _____ (e) $x = t \sin t,\ y = t \cos t$

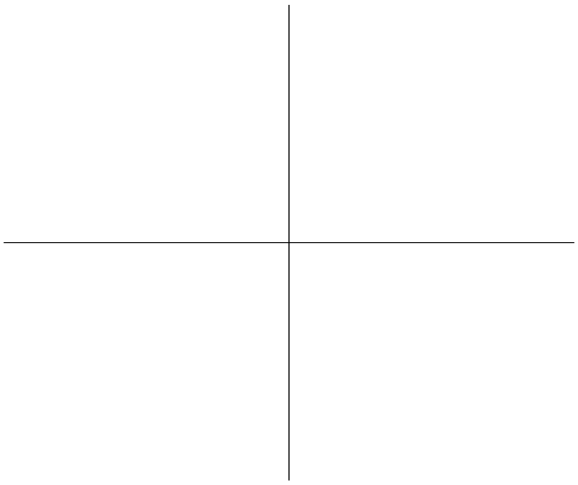
   Descriptions

   (1) Straight line
   (2) Portion of a line
   (3) Circle
   (4) Half-circle
   (5) Quarter-circle
   (6) Parabola
   (7) Portion of parabola
   (8) Spiral

3. (15 points) An aquarium is 1 ft wide, 1 ft tall, and 2 ft long. Assuming (for simplicity) that the density of the water in the tank is $60\frac{\text{lbs}}{\text{ft}^3}$, calculate the fluid force on one of the 1-by-2 foot sides.

   (Remember, since the density is already in terms of lbs, you will NOT need to multiply by gravity for this problem.)

4. (15 points) Calculate M_x (the moment about the x-axis), of the flat plate with uniform density $\rho = 1$ defined by the region between the curves $y = x^2$, $y = 1$, and $x = 0$. Sketch the region first!



5. (10 points) Find the slope of the tangent line to the curve $x = 2\cos t$, $y = \sin t$ at the point corresponding to $t = \pi/4$.

6. (15 points) Set up, but **DO NOT EVALUATE**, an integral that will give the surface area of the surface obtained by revolving the following curve about the given axis:

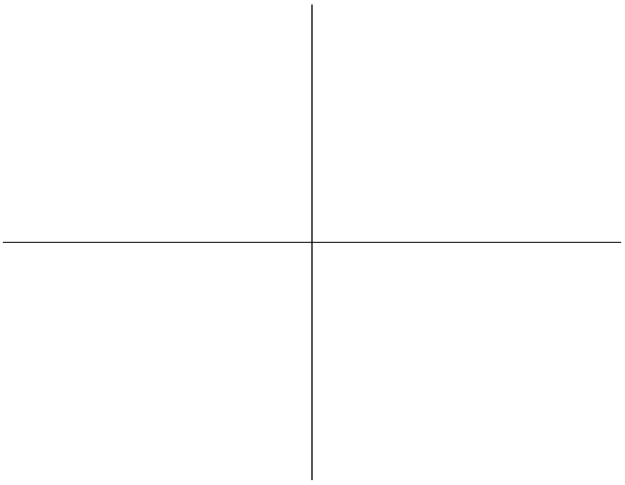
$$x = t^3, \qquad y = t^2, \qquad 0 \leq t \leq 1$$

(a) About the x-axis:

(b) About the y-axis:

7. Consider the polar curve $r = \sin 3\theta$.

   (a) (10 points) Sketch the curve on the axes below.



   (b) (10 points) Calculate the total area enclosed by the portion of the curve that lies within the first quadrant. (Watch your limits of integration!)