Math 241: Calculus and Analytic Geometry II

Exam 2

November 13, 2015

NAME:

To receive full credit you must clearly show all work and justify your answers. No books, notes, or calculators are allowed during this exam. This is a 50 minute exam.

Question:	1	2	3	4	5	Total
Points:	10	20	10	10	0	50
Score:						

1. (10 points) Find the equation of the tangent line to the curve $x = 6\sin(t)$, $y = t^2 + t$ at the point $(0,0)$.

2. Consider the polar equation $r = 4\sin(3\theta)$.

    (a) (5 points) Sketch the polar curve r.

    (b) (10 points) Find the area of one loop of r.

    (c) (5 points) Set up (but do not evaluate) the integral to find the length of one loop of r.

3. (10 points) The arc of the parabola $y = x^2$ from $(1, 1)$ to $(2, 4)$ is rotated about the y-axis. Find the area of the resulting surface.

4. (10 points) A vertical plate in the shape of an equilateral triangle with side length a is submerged in a liquid of density ρ. If the plate is submerged so that tip of the plate (top of the triangle) is at the surface of the liquid, find the hydrostatic force against one side of the plate.

5. (10 points (bonus)) Consider the region obtained by rotating curve $y = \frac{1}{x}$ about the x-axis on the interval $1 \leq x < \infty$.

    (a) Show that the volume of the above region is finite.

    (b) Show that the surface area of the above region is infinite.