Math 162: Calculus IIA

First Midterm Exam

October 21, 2008

NAME (please print legibly): _____

Your University ID Number: _____

Indicate your instructor with a check in the box:

Juan Ortiz-Navarro	MWF 10:00 - 10:50 AM	
Scott Bailey	MWF 9:00 - 9:50 AM	

- **The presence of calculators, cell phones, iPods and other electronic devices at this exam is strictly forbidden.**
- **Show your work and justify your answers. You may not receive full credit for a correct answer if insufficient work is shown or insufficient justification is given.**
- **Put your answers in the space provided at the bottom of each page.**
- **You are responsible for checking that this exam has all 8 pages.**

Part A		
QUESTION	VALUE	SCORE
1	13	
2	13	
3	13	
4	12	
5	20	
6	16	
7	13	
TOTAL	100	

Part A

1. (13 points) Consider the curves described by $y = x^2$ and $y = \sqrt{x}$.

(a) Sketch the region enclosed by these curves, and find the area of this region.

(b) Let S be the solid obtained by rotating the above region about the x-axis. Sketch S, along with a typical cross-section of S, and find the volume of S using the washer method (also called the cross-sectional method.)

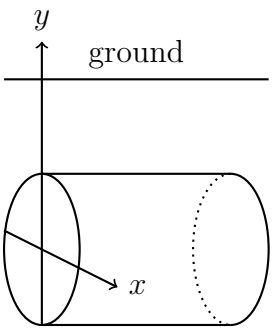
2. (13 points) Again consider the curves described by $y = x^2$ and $y = \sqrt{x}$.

(a) Let S be the solid obtained by rotating the region bounded by these curves about the y-axis. Sketch S, along with a typical cylindrical shell inside S, and find the volume of S using the cylindrical shells method.

(b) Let S be the solid obtained by rotating the region bounded by these curves about the line $x = 4$. Sketch S and find the volume of S using whichever method you want (washer method or cylindrical shells.)

3. (13 points)

Gasoline at a service station is stored in a cylindrical tank buried on its side, with the highest part of the tank 5 ft below the surface. The tank is 8 feet in diameter and 10 ft long. The density of gasoline is 45 lb/ft^3. Assume that the filler cap of each automobile is 2 feet above the ground. If the tank is initially full, how much work is done pumping half of the gasoline in the tank into automobiles?



4. (12 points)

Find the definite integrals, if they exist:

(a)

$$\int_{-\infty}^{-1} e^{-2t}\,dt$$

(b)

$$\int_{-1}^{1} \frac{1}{x^2 - 2x}\,dx$$

5. (20 points) Suppose $f(x)$ is a function whose derivative is given by

$$f'(x) = \sqrt{2x - x^2}$$

(a) Set up an integral for the length of the curve traced out by the graph of $f(x)$ from $x = 1$ to $x = 2$.

(b) Evaluate the integral found in part (a).

6. (16 points) Evaluate the integrals:

(a) $\int \tan x \sec^4 x \, dx =$

(b) $\int x \tan x \sec^4 x \, dx =$

7. (13 points) Find the area of the surface obtained by rotating the curve $y = \sqrt{2x+1}$, $1 \leq x \leq 7$, about the x-axis.