Math 162: Calculus IIA

First Midterm Exam

October 23, 2007

NAME (please print legibly): _____

Your University ID Number: _____

Indicate your instructor with a check in the box:

Juan Ortiz-Navarro	MWF 9:00 - 9:50 AM	
Doug Ravenel	MWF 10:00 - 10:50 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.**

QUESTION	VALUE	SCORE
1	16	
2	16	
3	10	
4	15	
5	15	
6	14	
7	14	
TOTAL	100	

1. (16 points) Consider the functions $y = x^2$ and $y = 3x$.

(a) Sketch the region enclosed by the graphs of the given functions, 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. (16 points) Again consider the functions $y = x^2$ and $y = 3x$.

(a) Let S be the solid obtained by rotating the region bounded by the graphs of these functions 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 the graphs of these functions about the line $x = -3$. Sketch S and find the volume of S using whichever method you want (washer method or cylindrical shells.)

3. (10 points) A rectangular swimming pool is 10 meters long and 4 meters wide, the sides are 2 meters high and the depth of the water is 1.5 meters. How much work is required to pump out all the water over the side? (Note: Use $g = 9.8m/s^2$ as the acceleration due to gravity and 1000 kg/m^3 as the desnity of water. Remember that 1 Joule = 1 $kg\frac{m^2}{s^2}$.)

4. (15 points) Evaluate the following integrals:

(a) $\displaystyle\int x^2 \cos(x^3 + 26)\, dx$

(b) $\displaystyle\int_e^{2e} \frac{1}{x(\ln x)^3}\, dx$

(c) $\displaystyle\int x^5 \sqrt{1 + x^2}\, dx$

5. (15 points) Evaluate the following integrals:

(a) $\int x^2 \, e^x \, dx$

(b) $\int x \, \sin x \, dx$

(c) $\int \arctan(2x) \, dx$

6. (14 points) Evaluate the following integrals:

(a) $\displaystyle\int_0^{10} \frac{1}{\sqrt[3]{x-10}}\,dx$

(b) $\displaystyle\int \sin^5\theta\cos^{10}\theta\;d\theta$

7. (14 points) Evaluate the following integrals.

(a) $\displaystyle\int \frac{1}{\sqrt{49+x^2}}\,dx$

(b) $\displaystyle\int \frac{1}{x^2+8x+15}\,dx$