Math 162: Calculus IIA

First Midterm Exam

October 15, 2013

NAME (please print legibly): _____

Your University ID Number: _____

Indicate your instructor with a check in the box:

Yoonbok Lee	MWF 9:00 - 9:50 AM	
Doug Ravenel	MWF 10:00 - 10:50 AM	
Geordie Richards	MWF 10:00 - 10:50 AM	
Kalyani Madhu	TR 12:30-13:45 PM	

- **The presence of calculators, cell phones, iPods and other electronic devices at this exam is strictly forbidden. IF YOU HAVE YOUR PHONE WITH YOU, YOU MUST TURN IT IN TO A PROCTOR BEFORE STARTING THE EXAM. FAILURE TO DO SO WILL BE TREATED AS AN ACADEMIC HONESTY VIOLATION.**
- **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 or half page.**
- **You are responsible for checking that this exam has all 10 pages.**

QUESTION	VALUE	SCORE
1	20	
2	20	
3	20	
4	20	
5	20	
TOTAL	100	

1. (20 points)

A swimming pool is 20 feet wide, 50 feet long and 5 feet deep. It is partly filled with water to a depth of 4 feet. How much work is needed to pump all the water out of the pool by lifting it to the top of the pool, which is five feet above the bottom? *Your answer should be expressed in foot-pounds. Assume that the density of water is 60 pounds per cubic foot.*

ANSWER:

2. (20 points)

(a) Find the integral

$$\int \frac{4x^2}{(x^2+1)(x^2-1)}\,dx.$$

ANSWER:

(b) Find the integral

$$\int \sec^3 x \tan^3 x \, dx.$$

ANSWER:

3. (20 points)

(a) Find the integral

$$\int_0^{\sqrt{3}} \frac{dx}{(9+x^2)^{3/2}}.$$

ANSWER:

(b) Find the integral

$$\int \frac{\cos x}{\sqrt{2\sin x + 1 - \cos^2 x}}\, dx.$$

ANSWER:

4. (20 points)

(a) Use integration by parts to prove the reduction formula

$$\int \cos^n x\, dx = \frac{\sin x \cos^{n-1} x}{n} + \frac{n-1}{n} \int \cos^{n-2} x\, dx \qquad \text{for } n \geq 2.$$

ANSWER:

(b) Use the formula to find

$$\int_0^{\pi/2} \cos^3 x \, dx.$$

ANSWER:

5. (20 points) Consider the region bounded by the x-axis and the curve $y = \sin x$ for $0 \leq x \leq \pi$.

(a) Find the volume of the solid obtained by rotating it about the x-axis.

ANSWER:

b) Find the volume of the solid obtained by rotating the same region about the y-axis.

ANSWER: