Math 162: Calculus IIA

First Midterm Exam
October 15, 2015

NAME (please print legibly): _____

Your University ID Number: _____

Indicate your instructor with a check in the box:

JJ Lee	MWF 9:00 - 9:50 AM	
Doug Ravenel	MWF 10:25 - 11:15 AM	
Timur Akhunov	MW 12:30 - 1:45 PM	
Eyal Neuman	MW 4:50-6:05 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) Use integration by parts to express $I_n = \int_0^{\pi/2} \cos^n x \, dx$ in terms of I_{n-2} for $n \geq 2$.

ANSWER:

(b) Use the formula of part (a) repeatedly to find I_6.

You will not get partial credit here if the formula you are using is incorrect.

ANSWER:

2. (20 points)

A tank has the shape of an inverted pyramid (point down) with a square base. The tank is 8 ft tall and the area of its base is 16 ft^2. The tank is filled with fluid to a height of 2 ft. Calculate the work done in pumping all the fluid from the tank. Assume that the density of the fluid is 12 pounds per cubic foot.

ANSWER:

3. (20 points) Hole in the sphere problem.   A hole of radius r is bored through the center of a sphere of radius $R > r$. We want to find the volume of the remaining portion of the sphere.

(a) Set up the integral as a solid of revolution around the y-axis using the shell method. Evaluate the integral

ANSWER:

b) Set up the integral using the washer method. Do not evaluate.

ANSWER:

4. (20 points)

(a) Let $a > 0$ be a fixed positive number. Compute the definite integral

$$\int_{a\sqrt{2}}^{2a} \frac{dx}{\sqrt{x^2 - a^2}}.$$

ANSWER:

(b) Find the integral

$$\int \frac{1}{\sqrt{x^2 + 6x + 10}}\, dx.$$

ANSWER:

5. (20 points)

(a) Find the integral

$$\int \sin^4 x \cos^3 x \, dx.$$

ANSWER:

(b) Evaluate the integral

$$\int \frac{x^2 + x + 2}{x^3 + x^2 + x + 1}\, dx.$$

ANSWER: