Math 162: Calculus IIA

Midterm I

February 23rd, 2017

Please circle your section:

Bobkova MW 3:25pm **Kirila TR 9:40am** **Lee MW 2pm**

Tucker MW 10:25am **Zhong MWF 9am**

NAME (please print legibly): _____

Your University ID Number: _____

Your University email _____

Pledge of Honesty

I affirm that I will not give or receive any unauthorized help on this exam and that all work will be my own.

Signature: _____

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

Instructions:

- **The use of calculators, cell phones, iPods and other electronic devices at this exam is strictly forbidden. You must be physically separated from your cell phone.**
- **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.**
- **You are responsible for checking that this exam has all 9 pages.**

Formulas:

- $\sin(x)\cos(x) = \frac{1}{2}\sin(2x)$
- $\sin^2(\theta) + \cos^2(\theta) = 1$
- $\tan^2(\theta) + 1 = \sec^2(\theta)$
- $\cos^2(\theta) = \frac{1}{2}(1 + \cos(2\theta))$
- $\sin^2(\theta) = \frac{1}{2}(1 - \cos(2\theta))$
- $\int \tan(x)dx = \ln|\sec(x)| + C$
- $\int \sec(x)dx = \ln|\sec(x) + \tan(x)| + C$
- $\int \frac{dx}{x^2+a^2} = \frac{1}{a}\arctan\left(\frac{x}{a}\right) + C$

1. (10 points) Find the area in the region between the curves $y^2 = x$ and $y = x - 2$.

2. (15 points) Find the average value of $f(x) = \sec^4 x \tan^3 x$ on the interval $[0, \pi/4]$.

3. (15 points) All of the following problems concern the solid of revolution generated by rotating about a given axis the region R, which lies between the x-axis and the curve $y = x - x^2$. You may use either the method of disks/washers or the method of cylindrical shells, but you **must clearly indicate which method** you are using in each problem.

(a) If R is rotated about the line $x = -10$, compute the volume of the resulting solid.

(b) If R is rotated about the y-axis, set up but do not evaluate an integral for computing the volume of the resulting solid.

4. (15 points) All of the following problems concern the solid of revolution generated by rotating about a given axis the region R, which lies between the x-axis and the curve $y = x - x^2$. You may use either the method of disks/washers or the method of cylindrical shells, but you **must clearly indicate which method** you are using in each problem.

(a) If R is rotated about the x-axis, compute the volume of the resulting solid.

(b) If R is rotated about the line $y = 3$, set up but do not evaluate an integral for computing the volume of the resulting solid.

5. (15 points) Assume that the density of a certain liquid is D kg/m^3 and that the acceleration due to gravity on Planet X is G m/s^2. A tank in the shape of an inverted cone has a height of 20 meters and a base radius of 5 meters and is filled with that liquid to a depth of 15 meters. Set up but **do not evaluate** an integral to determine the amount of work needed to pump all of the liquid to the top of the tank on Planet X.

6. (15 points) Find the following indefinite integrals.

(a)

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

(b)

$$\int \frac{1}{\sqrt{x^2 + 4x + 8}}\, dx$$

7. (15 points)

(a) Find the following indefinite integral.

$$\int \frac{e^x}{e^{2x} + e^x - 2}\, dx$$

(b) Set up the partial fraction decomposition for the following integral in terms of variables, but do not solve for those variables.

$$\int \frac{1}{(x^3 + x^2 + x)(x^3 - x)(x^2 + x)(x^2 + x + 1)}\, dx$$