

Math 162: Calculus IIA

Midterm I

February 23rd, 2016

Please circle your section:

Gage MW 2pm

Harper TR 9:40am

Lubkin MWF 9am

Lungstrum MW 3:25pm

Neuman TR 4:50pm

Tucker MW 10:25am

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	12	
2	12	
3	10	
4	13	
5	13	
6	13	
7	15	
8	12	
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.
- Put your answers in the spaces provided.
- You are responsible for checking that this exam has all 10 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. (12 points) Find the area contained between the curves $y = x^3$ and $y = 4x$.

2. (12 points) A spring has a natural length of 2m. A force of 30N is needed to stretch the spring to a length of 3m.

(a) Find the work, in Joules, required to stretch the spring from 3m to 4m.

(b) Now find the work, in Joules, required to stretch the spring from 3m to $(3+c)$ m, where c is a positive constant.

3. (10 points) Find the area underneath the curve $y = e^{\sqrt{x}}$ from $x = 0$ to $x = 1$.

4. (13 points) The region between the x -axis and the curve $y = \sin(x)$ for $0 \leq x \leq \pi$ is rotated about the x -axis. Compute the volume.

5. (13 points) The region between the x -axis and the curve $y = \sin(x)$ for $0 \leq x \leq \pi$ is rotated about the line $x = -1$. Compute the volume.

6. (13 points) Find the following definite integrals.

(a)

$$\int_0^{\pi/4} \sec^4(\theta) \tan^4(\theta) d\theta$$

(b)

$$\int_0^{\pi} x^2 \cos(x) dx$$

7. (15 points) Find the following indefinite integrals.

(a)

$$\int \frac{dx}{\sqrt{x^2 - 6x + 13}}$$

(b)

$$\int \frac{dx}{\sqrt{-x^2 + 6x - 5}}$$

8. (12 points)

(a) Find the following indefinite integral.

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

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

$$\int \frac{x^2 - 5x + 16}{(x^2 + 1)^2(x^2 - 1)^2(x - 1)^2} dx$$