

Math 142: Calculus II

Midterm 2 Practice

NAME (please print legibly): _____

Your University ID Number: _____

Indicate your instructor with a check in the appropriate box:

Crossen	MW 9-10:15	<input type="checkbox"/>
Zhong	MW 3:25-4:40	<input type="checkbox"/>

- You have 75 minutes to work on this exam.
- You are responsible for checking that this exam has all 9 pages.
- No calculators, phones, electronic devices, books, notes are allowed during the exam.
- Show all work and justify all answers.
- Please sign the pledge below.

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	15	
2	15	
3	10	
4	10	
5	10	
6	15	
TOTAL	75	

1. (15 points) Evaluate the following indefinite integrals.

(a) $\int \frac{x}{\sqrt{1-2x^2}} dx.$

(b) $\int e^x \sin x dx.$

2. (15 points) Evaluate the following definite integrals. Your answer should **NOT** involve any trigonometric functions.

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

(b) $\int_0^{\pi/4} \sec^4 x \tan x \, dx.$

3. (10 points) Consider the function $f(x) = 2 + 6x - 3x^2$.

(a) For $b > 0$, compute the average value of $f(x)$ on the interval $0 \leq x \leq b$. **Note:** Your answer should be a function of b .

(b) Find all numbers $b > 0$ such that the average value of $f(x)$ on $[0, b]$ is equal to 3.

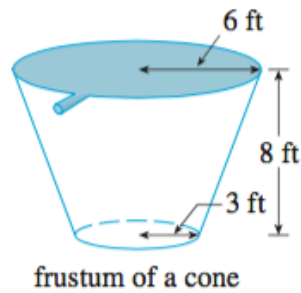
4. (10 points) The following problems concern the solid of revolution generated by rotating about a given axis the region R , which lies between the x -axis and the curve $y = x - x^2$. You may use either the method of disks/washers or the method of cylindrical shells, but you must clearly indicate which one you are using in each problem.

(a) If R is rotated about the x -axis, set up but do not evaluate an integral for computing 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.

5. (10 points) Consider the functions $f(x) = \sin x$ and $g(x) = \cos x$. Compute the area between the graphs of these two functions on the interval $[0, \pi/2]$. Your answer should **NOT** involve any trigonometric functions.

6. (15 points) The tank is (see picture below) is full of water. Find the work required to pump the water out of the spout at the top. Use the water weights 62.5 lb/ft^3 .



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Formula Sheet

- $\sin^2 x + \cos^2 x = 1$
- $1 + \tan^2 x = \sec^2 x$
- $1 + \cot^2 x = \csc^2 x$
- $\sin(2x) = 2 \sin x \cos x$
- $\sin^2 x = \frac{1 - \cos(2x)}{2}$
- $\cos^2 x = \frac{1 + \cos(2x)}{2}$
- $\sin(x + y) = \sin x \cos y + \cos x \sin y$
- $\cos(x + y) = \cos x \cos y - \sin x \sin y$
- $\sin x \cos y = \frac{\sin(x - y) + \sin(x + y)}{2}$
- $\sin x \sin y = \frac{\cos(x - y) - \cos(x + y)}{2}$
- $\cos x \cos y = \frac{\cos(x - y) + \cos(x + y)}{2}$