MTH 142 **Midterm 2 - Practice** **November 17, 2016**

Last/Family Name: _____

First/Given Name: _____

Student ID Number: _____

Instructor (circle): Hambrook (MW 3:25) Zeng (MW 9:00)

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

You must write out and sign the honor pledge for your examination to be valid.

_____

_____

_____

Signature: _____ Date: _____

Instructions:

- Time: 75 minutes.
- Write in pencil or pen.
- No notes, textbooks, phones, calculators, or other electronic devices.
- If you need extra space, use the back of the page, and indicate it.
- To receive full credit, you must show your work and justify your answers.
- The final page is a formula sheet. You may detach it.

QUESTION	VALUE	SCORE
1	14	
2	15	
3	17	
4	17	
5	12	
TOTAL	75	

1. (14 points) Evaluate the integrals.

(a) $\int \sec^5 x \tan^3 x \, dx$

(b) $\int_0^{\pi/4} \cos^4 x \, dx$

2. (15 points) Evaluate the integrals.

(a) $\displaystyle\int \frac{x}{1+3x}\,dx$

(b) $\displaystyle\int e^{\theta}\cos 3\theta\,d\theta$

3. (17 points) Sketch the region enclosed by the given curves and find its area.

$$y = x^3 - 7x^2 + 10x, \qquad y = -x^3 + 7x^2 - 10x.$$

4. (17 points)

A 10-ft chain weighs 30 lb. It hangs vertically with the upper end attached to a tall ceiling. Find the work done in lifting the lower end of the chain to the ceiling so that it becomes level with the upper end.

5. (12 points) Consider the solid obtained when the region bounded by the curves

$$y = x^3, \quad y = 8, \quad x = 0$$

is rotated about the line $x = 3$. Use the method of **cylindrical shells** to set up an integral equal to the volume of the solid. Do **not** evaluate the integral.

Formula Sheet

$$\frac{d}{dx}\sin x = \cos x \qquad \frac{d}{dx}\cos x = -\sin x$$
$$\frac{d}{dx}\sec x = \sec x \tan x \qquad \frac{d}{dx}\csc x = -\csc x \cot x$$
$$\frac{d}{dx}\tan x = \sec^2 x \qquad \frac{d}{dx}\cot x = -\csc^2 x$$

$$\frac{d}{dx}\arcsin x = \frac{1}{\sqrt{1-x^2}} \qquad \frac{d}{dx}\arccos x = -\frac{1}{\sqrt{1-x^2}}$$
$$\frac{d}{dx}\operatorname{arcsec} x = \frac{1}{|x|\sqrt{x^2-1}} \qquad \frac{d}{dx}\operatorname{arccsc} x = -\frac{1}{|x|\sqrt{x^2-1}}$$
$$\frac{d}{dx}\arctan x = \frac{1}{1+x^2} \qquad \frac{d}{dx}\operatorname{arccot} x = -\frac{1}{1+x^2}$$

$$\sin^2 x + \cos^2 x = 1 \qquad \tan^2 x + 1 = \sec^2 x \qquad 1 + \cot^2 x = \csc^2 x$$

$$\sin^2 x = \frac{1}{2}(1 - \cos(2x)) \qquad \sin A \sin B = \frac{1}{2}(\cos(A-B) - \cos(A+B))$$
$$\cos^2 x = \frac{1}{2}(1 + \cos(2x)) \qquad \cos A \cos B = \frac{1}{2}(\cos(A-B) + \cos(A+B))$$
$$\sin x \cos x = \frac{1}{2}\sin(2x) \qquad \sin A \cos B = \frac{1}{2}(\sin(A-B) + \sin(A+B))$$

$$\int \tan x\, dx = \ln|\sec x| + C \qquad \int \sec x\, dx = \ln|\sec x + \tan x| + C$$