1st midterm for MATH 1272: Calculus II, section 030

Name: **Section Number:**
ID #: **Teaching Assistant:**

Instructions:

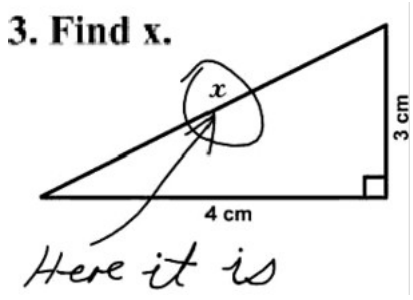
- *Please don't turn over this page until you are directed to begin.*
- There are 6 problems (and problems 1, 2, 4, and 5 have 2 parts) on this exam.
- There are 7 pages to the exam, including this page. All of them are one-sided. If you run out of room on the page that you're working on, use the back of the page.
- Please show all your work. Answers unsupported by an argument will get little credit.
- Scientific calculators are allowed. No books or notes are allowed. Please turn off your cell phones.

Grading summary

Problem:	1	2	3	4	5	6	total
Possible:	10 points	10 points	10 points	15 points	15 points	10 points	70 points
Grade:							

Some helpful formulas

$\sin^2(x) + \cos^2(x) = 1$	$\tan^2(x) + 1 = \sec^2(x)$	$1 + \cot^2(x) = \csc^2(x)$
$2\sin^2(x) = 1 - \cos(2x)$	$2\cos^2(x) = 1 + \cos(2x)$	$2\sin(x)\cos(x) = \sin(2x)$
$\int \tan(x)\,dx = \ln\lvert\sec(x)\rvert + C$	$\int \sec(x)\,dx = \ln\lvert\sec(x) + \tan(x)\rvert + C$	$\int \csc(x)\,dx = \ln\lvert\csc(x) - \cot(x)\rvert + C$



1. **(10 points total, 5 points each)**

   (a) Evaluate the integral

$$\int x \sec^2(x)\, dx.$$

   (b) Evaluate the integral

$$\int x \tan^2(x)\, dx.$$

   Hint: The previous part may be helpful.

2. **(10 points total, 5 points each)** Determine if the following integrals are convergent or divergent. If convergent, evaluate the integral:

(a)

$$\int_5^\infty \frac{e^x + 7}{e^x + 2} dx.$$

(b)

$$\int_0^\infty \frac{1}{x(\ln x)^3} dx.$$

3. **(10 points)** Evaluate the integral

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

4. **(15 points total)**

(a) **(10 points)** Evaluate the integral

$$\int \frac{2u\ du}{u^2 + 2u - 3}.$$

(b) **(5 points)** Evaluate the integral

$$\int \frac{dx}{2\sqrt{x+3} + x}.$$

Hint: The previous part may be helpful.

5. **(15 points total)**

(a) **(5 points)** Find the area of the region $\mathcal{R}$ in the plane bounded by the curves

$$y = e^x; \quad y = 0; \quad x = 0; \quad x = 1.$$

(b) **(10 points)** Find the centroid (or center of mass) of the region $\mathcal{R}$.

6. **(10 points)** Find the length of the curve $y = \ln(\cos(x))$ on the interval $0 \leq x \leq \pi/4$.