Math 125C - Winter 2011
Exam 2
February 24, 2011

Name: _____

Section: _____

Student ID Number: _____

PAGE 1	12	
PAGE 2	12	
PAGE 3	14	
PAGE 4	12	
PAGE 5	10	
Total	60	

- There are 5 pages of questions. Make sure your exam contains all these pages.
- You are allowed to use a scientific calculator (**no graphing calculators**) and one **hand-written** 8.5 by 11 inch page of notes.
- You must show your work on all problems. The correct answer with no supporting work may result in no credit. **Put a box around your FINAL ANSWER for each problem and cross out any work that you don't want to be graded.** Give exact answers wherever possible.
- If you need more room, use the backs of the pages and indicate to the grader that you have done so.
- Raise your hand if you have a question.
- Any student found engaging in academic misconduct will receive a score of 0 on this exam.
- You have 80 minutes to complete the exam. Budget your time wisely.
  SPEND NO MORE THAN 15 MINUTES PER PAGE!

GOOD LUCK!

1. (12 points) Compute the following integrals.

   (a) $\int \sec^4(x)\tan^3(x)\,dx.$

   (b) $\int_1^4 \sqrt{y}\ln(\sqrt{y})\,dy$

2. (12 points) Compute the following integrals.

(a) $\displaystyle\int \frac{4x-15}{x^3-5x^2}\,dx.$

(b) $\displaystyle\int \frac{x}{\sqrt{x^2+8x+25}}\,dx.$

3. (14 points) Answer the following questions.

(a) (6 pts) Find the average value of $f(x) = \tan^{-1}(3x)$ on the interval $x = 0$ to $x = \frac{1}{3}$.

(b) (8 pts) Consider the arc length of the curve $y = x^3$ from $x = 0$ to $x = 4$.

i. Set up (BUT DO NOT EVALUATE) an integral for this length.

ii. Use Simpson's Method with $n = 4$ subintervals to approximate the value of the arc length. (Show your work)

4. (12 points)

(a) Determine if the improper integral $\displaystyle\int_1^\infty \frac{\sin\left(\frac{1}{x}\right)}{x^2}\,dx$ converges or diverges. If it diverges, explain why. If it converges, give the value it approaches.

(b) Determine if the improper integral $\displaystyle\int_0^1 x^{-1}\ln(x)\,dx$ converges or diverges. If it diverges, explain why. If it converges, give the value it approaches.

5. (10 points) Consider the region R in the first quadrant of the xy-plane bounded by $y = x^2$, $y = 4$ and the y-axis. The water in a full tank is in the shape of the solid obtained by rotating R about the y-axis.

   Assume all lengths are in meters, so the tank is 4 meters high. And remember the density of water is 1000 kg/m^3 and gravity is 9.8 m/s^2.

   Set up and evaluate an integral for the work required to pump all the water to the top of the tank and over the edge.