Math 125C **Second Midterm** **Spring 2016**

Your Name

Your Signature

Student ID #

Quiz Section

PLEASE READ the DIRECTIONS below:

- Do not open the test until instructed to do so. This test has 5 problems on 5 pages. Once the test starts, please check that you have a complete exam.
- This exam is closed book. You may use one $8\frac{1}{2} \times 11$ page of handwritten notes. Do not share notes.
- Only a Ti-30x IIS calculator is allowed. Silence your cell phone and put it away.
- In order to receive credit, you **MUST SHOW YOUR WORK**. If we cannot tell how you are getting your answers, you may receive little or no credit, even if the answer happens to be correct.
- Simplify your answers as much as possible but leave them in exact form (e.g. $\pi\sqrt{2} + \frac{1}{2}$). Do not give decimal approximations, unless otherwise instructed.
- **Place a BOX around YOUR FINAL ANSWER to each question.**
- 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.
- Read each question carefully, before and after answering it.

Good luck!

Problem	Total Points	Score
1	12	
2	12	
3	8	
4	9	
5	9	
Total	50	

1. Compute the following definite integrals. Simplify, but leave your answers in exact form.

(a) [**6 points**] $\displaystyle\int_{\pi/4}^{\pi/3} \tan^3(\theta)\sec^2(\theta)\ d\theta$

(b) [**6 points**] $\displaystyle\int_1^2 x^3 \ln x\ dx$

2. Evaluate the following indefinite integrals.

(a) [**6 points**] $\displaystyle\int \frac{1}{x^2\sqrt{x^2+25}}dx$

(b) [**6 points**] $\displaystyle\int \frac{2x^3+1}{x^3-x^2}\,dx$

3.

(a) [**3 points**] Write an integral expression to compute the average value of $f(x) = \cos(x^2)$ over the interval $[-1, 2]$. DO NOT try to compute the integral.

(b) [**5 points**] Use the Trapezoidal Rule with $n = 6$ subintervals to approximate the integral from part (a).

Your answer should either be in exact form (but simplify all you can), or in decimal form with at least 4 digits of precision.

4. [**9 points**] Consider the improper integral: $\displaystyle\int_0^\infty \frac{1}{e^x+1}\,dx$.

If it converges, evaluate it. If it diverges, show why. Show all your steps carefully.

5. [**9 points**] A tank in the shape of the bottom half of a sphere of radius $R = 5$ m is partially filled with water, to a height of 3 meters. The density of water is 1000kg/m^3 and the gravitational constant is $g = 9.8\ \text{m/s}^2$. Compute the work necessary to pump all the water to the top of the tank.

(First draw a picture and clearly label your origin and axes. Make sure to show your steps clearly. Include units in your final answer.)