Math 125C **First Midterm** **Spring 2016**

Your Name

Your Signature

Student ID #

Quiz Section

Professor's Name

TA's Name

PLEASE READ the DIRECTIONS below:

- Do not open the test until instructed to do so. This test has 5 problems on 4 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** $\boxed{\textbf{YOUR FINAL ANSWER}}$ **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. Do your best, and show your work.
- Take a deep breath. You've got this. Good luck!

Problem	Total Points	Score
1	14	
2	7	
3	7	
4	8	
5	14	
Total	50	

1. [**14 points**] Evaluate the following integrals. Show all steps. Simplify and box your answer.

(a) [**4 points**] $\displaystyle\int \frac{3x-2}{\sqrt{x}}\,dx$

(b) [**5 points**] $\displaystyle\int \sqrt{x}\sin(1+x^{\frac{3}{2}})\,dx$

(c) [**5 points**] $\displaystyle\int_1^2 \frac{5}{2-3x}\,dx$

2. [**7 points**]

A particle is moving along a straight line. At all times $t \geq 0$ the velocity of the particle is given by

$$v(t) = 3t^2 - 12$$

Let b be an arbitrary number greater than 10. Find the total distance traveled by the particle from time $t = 0$ to time $t = b$. Your answer should be an expression involving b. Show all work.

3. [**7 points**]

(a) You are given that $g(x)$ is a continuous function on [0,3] such that

$$\int_0^3 g(x)dx = -1 \text{ and } \int_2^3 g(x)dx = -3$$

Compute $\int_0^2 5g(x) + 7\ dx$. Show all steps.

(b) Sue and Kathy race each other, running with continuous positive velocities $v_S(t)$ and $v_K(t)$, respectively. They start the race at the starting line at $t = 0$ seconds. Kathy runs faster than Sue throughout the race. Write a definite integral that would equal the area between their velocity curves over the first 10 seconds of the race, and a brief English sentence giving the physical interpretation of what that area and integral represent.

4. [**8 points**] Compute each of the following expressions. Justify your answer.

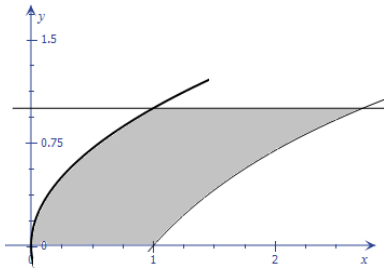
(a) $\dfrac{d}{dx}\displaystyle\int_0^{3x} \sin(t^2)\ dt$

(b) $\displaystyle\int_0^3 \frac{d}{dx}(\sin(x^2))\ dx$

(c) $\dfrac{d}{dx}\displaystyle\int_0^3 \sin(t^2)\ dt$

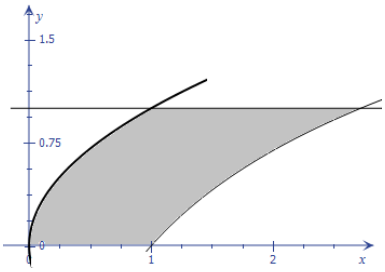
5. [**14 points**] Let $\mathcal{R}$ denote the region bounded by the graphs of $x = y^2$, $x = e^y$, $y = 0$, and $y = 1$.

(a) [**6 points**] Compute the **area** of this region $\mathcal{R}$. Show your work.



(b) [**8 points**] **SET UP** (but **DO NOT EVALUATE**) definite integrals equal to the **volumes** of the solids of revolution obtained by rotating the same region $\mathcal{R}$ about:

(i) **about the y-axis**.



(ii) about the **horizontal line $y = -1$**.