**Math 125D** **First Midterm** **Spring 2017**

| Your Name | Your Signature |
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Student ID #

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Quiz Section

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PLEASE READ the DIRECTIONS below:

- Do not open the test until instructed to do so. This test has 4 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 $\boxed{\text{YOUR FINAL ANSWER}}$ 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.
- Good luck!

| Problem | Points | Score |
|---|---|---|
| 1 | 15 | |
| 2 | 10 | |
| 3 | 10 | |
| 4 | 15 | |
| Total | 50 | |

1. (15 points) Evaluate the following integrals. Show all steps. Simplify and box your answers.

(a) $\displaystyle\int \frac{x^3+\sqrt{x}}{x} - \frac{2}{\sqrt{1-x^2}}\,dx$

(b) $\displaystyle\int \sin(t)\cos^3(t)+2t\;dt$

(c) $\displaystyle\int_0^{\ln(2)} \frac{e^x}{1-2e^x}\,dx$

2. (10 points) On planet Zorg, the acceleration due to gravity is 8 $m/s^2$. A Zorgian student throws an orange TI 30X calculator, with some initial velocity $v_0$, from a cliff 50 meters above the ground. The calculator hits the ground 5 seconds after it was thrown, smashing into pieces.

   (a) (4 points) Compute the initial velocity $v_0$, and specify if the calculator was thrown up or down.

   (b) (6 points) Compute the total distance traveled by the ill-fated calculator in the first **3 seconds** after it was thrown.

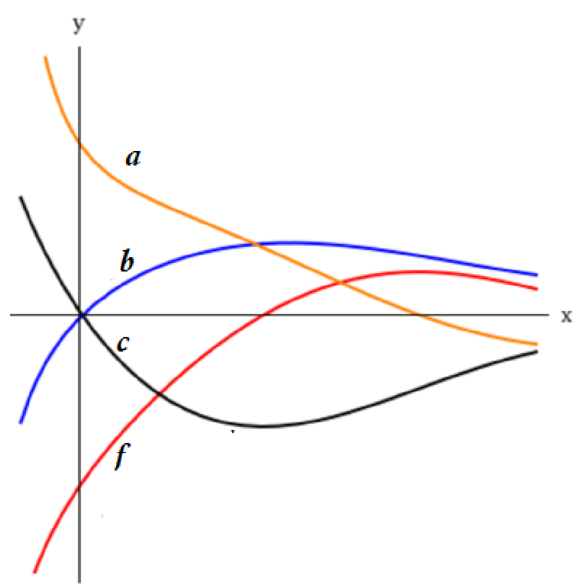
3. (10 points) Answer the following three (unrelated) questions:

   (a) (4 points) Compute the following limit of a Riemann Sum by first writing it as a definite integral, and then evaluating the integral.

   $$\lim_{n\to\infty} \sum_{i=1}^{n} \left( \frac{3}{n} \sqrt{4 - \frac{3i}{n}} \right)$$

   (b) (4 points) Let $g(x) = \int_0^{2x} \cos(\pi t^2)\, dt$. Compute $g'(1/2)$.

   (c) (2 points) The graph of a function $f$ is shown below. Which of the graphs a-c is an antiderivative of $f$? No need to justify.



4. (15 points) Consider the region $R$ enclosed by the curve $y = x^3$, the **horizontal** line $y = 8$, and the $y$-axis.

   (a) (7 points) Find the value of the constant $b$ such that the **horizontal** line $y = b$ divides the region $R$ into two regions of equal area.

   (b) (8 points) A solid is obtained by rotating the above region $R$ around the **horizontal** line $y = 8$. SET UP integrals equal to the volume of this solid using BOTH the method of disks/washers and the method of cylindrical shells (DO NOT EVALUATE the integrals.)

   Disks/Washers:

   Shells: