Math 125C Spring 2024
Mid-Term Exam Number One
April 18, 2024

Name: _____ Student ID no. : _____

Signature: _____ Section: _____

1	15
2	15
3	10
4	10
5	15
6	10
Total	75

- Show all work for full credit.
- All answers should be exact unless the problem asks for an estimate, approximation or decimal value.
- You may use a TI 30X-IIS calculator during this exam. **All other electronic devices are not allowed**, and should be turned off and put away for the duration of the exam.
- If you use a trial-and-error or guess-and-check method when an algebraic method is available, you will not receive full credit.
- You may use one hand-written 8.5 by 11 inch page of notes. Write your name on your notesheet and turn it in with your exam.
- No scratch or other paper is allowed during the exam other than the notesheet described above. If you need more space to work, use the back of the exam pages.
- You have 80 minutes to complete the exam.
- Good luck!

1. Evaluate the following integrals.

(a) $\int x(x+1)(x+2)\,dx$

(b) $\int \left(3^x - 4e^x + 5\sec^2 x\right)\,dx$

(c) $\int \dfrac{2e^x + 4x}{e^x + x^2}\,dx$

2. Evaluate the following integrals.

(a) $\int_{-1}^{4} |\sin x|\, dx$

(b) $\int_{0}^{2} \left(5x + \sqrt{4 - x^2}\right)\, dx$

(c) $\int x\sqrt{2x + 4}\, dx$

3. A tomato is thrown upward from an unknown height above the ground, and then allowed to fall freely to the ground.

   Ten seconds after it is thrown, the tomato is half way to the ground (i.e., its height is half what it was when it was thrown).

   Twelve seconds after it is thrown, the tomato is 10 meters above the ground.

   From what height was the tomato thrown?

   Use $g = 9.8$ m$/s^2$ for the acceleration due to gravity.

4. Find the area of the region in the first quadrant bounded by $y = \frac{1}{x}$, $y = \frac{1}{x^2}$, $y = 4$ and $y = 9$.

5. Let R be the region bounded by $y = x^2$, the x-axis, $x = 2$ and $x = 3$.

   Let V be the volume of the solid of revolution obtained by revolving R about the line $x = 5$.

   (a) Use the method of cross-sections (i.e., the disk or washer method) to express V using one or more integrals. Do not evaluate!

   (b) Use the method of cylindrical shells to express V using one or more integrals. Do not evaluate!

   (c) Find V using one of your integral expressions above (your choice). Express your answer as a decimal number with at least 3 digits to the right of the decimal point.

6. Estimate the area under the curve $y = e^x \tan x$ from $x = 0$ to $x = 1$ using the midpoint rule with $n = 4$.

   Give your answer as a decimal number with at least 3 digits to the right of the decimal point.