Math 125 D Autumn 2023
Mid-Term Exam Number One
October 19, 2023

Name: _____ Student ID no. : _____

Signature: _____ Section: _____

1	15
2	15
3	10
4	10
5	10
6	10
Total	70

- Show all work for full credit.
- All answers should be exact unless the problem asks for an estimate or approximation.
- 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!

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1. Evaluate the following indefinite integrals.

(a) $\int \left(\sqrt{x}+1\right)\left(\sqrt{x}+2\right)\,dx$

(b) $\int \dfrac{x^3+3x^2+1}{x^2}\,dx$

(c) $\int x^5\sqrt{x^3+1}\,dx$

2. Evaluate the following definite integrals.

(a) $\int_0^6 |x^2 - 4|\, dx$.

(b) $\int_{-4}^4 f(t)\, dt$ where $f(t) = g'(t)$ and $g(t) = te^{2t}$.

(c) $\int_{-1}^1 \dfrac{e^x}{e^x + 1}\, dx$

3. Find the area of the region bounded by the curves $y = \dfrac{1}{x^2}$, $y = \sqrt{x}$, $x = 3$ and the x-axis.

4. You find yourself on a distant planet, where the acceleration due to gravity is not the same as on Earth.

   To measure the acceleration due to gravity, you perform an experiment.

   You construct a 50 meter tall tower. From the top of the tower, you throw a rock downward.

   The rock hits the ground exactly 6 seconds later.

   The final 10 meters of its fall takes exactly 1 second.

   What is the acceleration due to gravity on this distant planet?

5. Let $g(x) = \cos x \int_{3x}^{x^3} e^{t^2}\, dt$.

   Find $g'(x)$ (your answer may involve an integral or two).

6. Let R be the region bounded by the x-axis, $y = 2 - \frac{1}{2}x$, and $y = x - 3$.

   (a) Using one or more integrals, express the volume of the solid of revolution that we get by revolving R about the x-axis. **Do not evaluate your volume expression**.

   (b) Using one or more integrals, express the volume of the solid of revolution that we get by revolving R about the y-axis. **Do not evaluate your volume expression**.