

Math 125 D Winter 2024  
Mid-Term Exam Number One  
January 25, 2024

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!

1. Evaluate the following indefinite integrals.

(a)  $\int (3x^6 - 5 + \sin 4x) dx$

(b)  $\int (2x + \sqrt{x})^2 dx$

(c)  $\int \frac{(x^2 + 1)(x + 1)}{x^2} dx$

2. Evaluate the following definite integrals.

(a)  $\int_{-2}^5 |3 - |x|| dx$

(b)  $\int_0^1 x^2 \cos(4x^3) dx$

(c)  $\int_0^3 x\sqrt{x+1} dx$

3. Evaluate the following limit by interpreting it as an integral expression and evaluating the integral:

$$\lim_{n \rightarrow \infty} \sum_{i=1}^n \frac{1}{n \left(1 + \frac{10i}{n}\right)}$$

4. Find the area of the region bounded by  $y = \frac{1}{2}$ ,  $y = \frac{1}{x^2}$ ,  $x = 1$ ,  $x = 4$  and the  $x$ -axis.

5. This problem takes place on Earth, where we will assume acceleration due to gravity is  $9.8 \text{ m/s}^2$ .

A person in a tall building has two tomatoes: tomato A and tomato B.

The person drops tomato A from a height of 100 meters; they measure the time it takes for the tomato to fall to the ground.

With what speed should they throw tomato B downward so that it takes half as long to fall to the ground as tomato A took?

Give your answer as a decimal number with at least four digits.

6. Estimate the integral  $\int_0^2 \ln(x^2 + 1) dx$  by using four rectangles and left-endpoints. Simplify your answer to a single decimal number with at least four digits.