

Math 1022 BL01
Fall 2024 B Term
Midterm Exam II
11/26/24
Time Limit: 50 Minutes

Name (Print): _____

This exam contains 7 pages (including this cover page) and 7 problems. Check to see if any pages are missing. Enter all requested information on the top of this page, and put your initials on the top of every page, in case the pages become separated.

You may *not* use your books, notes, or any calculator on this exam.

You are required to show your work on each problem on this exam. The following rules apply:

- **Organize your work**, in a reasonably neat and coherent way, in the space provided. Work scattered all over the page without a clear ordering will receive very little credit.
- **Mysterious or unsupported answers will not receive full credit.** A correct answer, unsupported by calculations, explanation, or algebraic work will receive no credit; an incorrect answer supported by substantially correct calculations and explanations might still receive partial credit.
- **Manage the empty space wisely.**
- **Write legibly in the answer boxes.**
- Midpoint rule: query points m_i ,

$$M_n = \sum_{i=1}^n f(m_i) \Delta x.$$

- Trapezoidal rule

$$T_n = \frac{\Delta x}{2} (f(x_0) + 2f(x_1) + \cdots + 2f(x_{n-1}) + f(x_n)).$$

Do not write in the table to the right.

Problem	Points	Score
1	24	
2	21	
3	15	
4	20	
5	20	
6	0	
7	0	
Total:	100	

1. (24 points) Evaluate the following indefinite integrals using any method we have learned so far. **Write the final answer *legibly* in the box.**

(a) (6 points)

$$\int \ln(x) dx. \text{ (Show work!)}$$

Answer

(b) (6 points)

$$\int z e^{3z} dz.$$

Answer

(c) (6 points)

$$\int \cos^2(x) \sin(x) dx.$$

Answer

(d) (6 points)

$$\int \frac{t}{4 - t^2} dt.$$

Answer

2. (21 points) Evaluate the following definite integrals using any method we have learned so far. **Write the final answer *legibly* in the box.**

(a) (8 points)

$$\int_0^{\pi/3} \sin^2(3x) \, dx.$$

Answer

(b) (8 points) [Leave your answer in terms of natural logs.]

$$\int_0^3 \ln(t^2 + 4) \, dt.$$

Answer

(c) (5 points)

$$\int_{-\pi}^{\pi} x^2 \sin(x) \, dx.$$

Answer

3. (15 points) Consider the definite integral

$$\int_0^{3\pi} \sin\left(\frac{\theta}{3}\right) d\theta.$$

- (a) (3 points) Evaluate the integral directly.

Answer

- (b) (4 points) Express P , the partition of the given interval using 3 subintervals of equal width. Determine $\Delta\theta$.

$\Delta\theta =$

$P =$

- (c) (4 points) Approximate the integral using 3 subintervals and the **midpoint** rule. List the query points. [If you don't know how to evaluate the function at the query points, then leave it in terms of $\sin$ (some angle).]

Query points:

$M_4 =$

- (d) (4 points) Approximate the integral using 3 subintervals and the **trapezoidal** rule. List the query points.

Query points:

$T_4 =$

4. (20 points) Evaluate the following integrals using **any** method. **Write the final answer legibly in the box.** You may use the answer of a problem found in this exam.

(a) (7 points)

$$\int \sec^3(x) dx.$$

Answer

(b) (7 points)

$$\int \tan^3(x) dx.$$

Answer

(c) (6 points)

$$\int \sec^3(x) \tan^3(x) dx.$$

Answer

5. (20 points) Evaluate the following integrals using **any** method. **Write the final answer *legibly* in the box.**

(a) (12 points)

$$\int \frac{9}{x^2 - 9} dx.$$

Answer

(b) (8 points)

$$\int \frac{x + 1}{x(x^2 - 4)} dx.$$

Answer

6. (5 points (bonus)) Propose **four** methods to evaluate the integral

$$\int \frac{x}{x^2 - 1} dx$$

and show that they **all** yield the same answer.

7. (5 points (bonus))

$$\int \frac{x + 1}{x(x^2 + 4)} dx.$$