

Math 1022 BL01

Fall 2024 B Term

Midterm Exam

11/04/24

Time Limit: 50 Minutes

Name (Print): _____

This exam contains 7 pages (including this cover page) and 6 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.**
- Sum Formulas

$$\sum_{k=1}^n k = \frac{n(n+1)}{2},$$
$$\sum_{k=1}^n k^2 = \frac{n(n+1)(2n+1)}{6},$$
$$\sum_{k=1}^n k^3 = \left[\frac{n(n+1)}{2} \right]^2.$$

Problem	Points	Score
1	20	
2	20	
3	20	
4	20	
5	20	
6	0	
Total:	100	

Do not write in the table to the right.

1. (20 points) Evaluate the following indefinite integrals using any method we have learned so far. **Write the final answer *legibly* in the box.**

(a) (5 points)

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

Answer

(5 points)

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

Answer

(5 points)

$$\int \left(x^4 + \frac{1}{\sqrt{x}} + \pi \right) dx.$$

Answer

(5 points)

$$\int \sqrt{t} (1 + t^2) dt.$$

Answer

2. (20 points) Evaluate the following definite integrals using any method we have learned so far. **Write the final answer *legibly* in the box.**

(a) (5 points)

$$\int_0^1 x^{88} dx.$$

Answer

(5 points)

$$\int_0^{\frac{1}{4}} \sec^2(\pi\theta) d\theta.$$

Answer

(5 points)

$$\int_{-1}^1 (x^3 + x) dx$$

Answer

(5 points)

$$\int_1^2 \left(\frac{1}{t^2} - \frac{1}{t^4} \right) dt.$$

Answer

3. (20 points) Consider the definite integral

$$\int_0^2 (1 - x) dx.$$

- (a) (12 points) Using the **limit** of a Riemann sum, evaluate the integral by using a **right-endpoint approximation**. See the sum formulas on the first page. **Write the final answer *legibly* in the box.**

Answer

- (8 points) Evaluate the integral directly using the Evaluation Theorem (FTC II) [to verify your answer for part 1]. **Write the final answer *legibly* in the box.**

Answer

4. (20 points) A roller coaster, at time t , attains the velocity $v(t) = \cos(2\pi t)$.
- (a) (15 points) Calculate the net displacement of the roller coaster for $0 \leq t \leq 2$. **Write the final answer *legibly* in the box.**

Answer

- (5 points) Calculate the total distance traveled by the roller coaster $0 \leq t \leq 2$. **Write the final answer *legibly* in the box.**

Answer

5. (20 points) Calculate the following integrals using any method we have learned so far. **Write the final answer *legibly* in the box.**

(a) (8 points)

$$\int x^2 (x^3 - 6)^2 dx.$$

Answer

(8 points)

$$\int 4x^4 e^{-x^5} dx.$$

Answer

(4 points)

$$\int_{-2}^2 \frac{2x^3}{x^2 + 1} dx.$$

Answer

6. (5 points (bonus)) Consider the integral $\int_{-1}^1 x^4 dx$. Suppose we make a rather contrived change of variable $u = x^2$. Carry the procedure out and find the definite integral. What went wrong?