Name: _____

ID number: _____

Instructions:

- 1. This is a one-hour exam.
- 2. There are 10 problems on this exam.
- 3. No books, notes, or calculators are allowed.
- 4. Please turn off your cell phone.
- 5. Circle one and only one choice for each multiple-choice problem. No partial credit will be given for multiple-choice problems.
- 6. Show all relevant work on non-multiple-choice problems. Partial credit will be given for steps leading to the correct solutions.
- 7. You may use a writing utensil, your own brain and the paper provided in this exam. Use of any other persons or resources will be considered cheating and will be reported to the Office of the Dean of Students.

I agree to abide by the instructions above:

Signature: _____

Useful trig formulas: $\sin^2 x = \frac{1}{2}(1 - \cos 2x)$

\cos^2	x	=	$\frac{1}{2}$	1	+	(
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 $\frac{1}{2}(1+\cos 2x) \qquad \qquad \sin x \cos x = \frac{1}{2}\sin 2x$

Page	Score	Points Possible
2		14
3		14
4		14
5		14
6		16
7		14
8		14
Total		100

Midterm Exam 2

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- **1.** (7 points) Given two series $\sum a_n$ and $\sum b_n$, which of the following statements is true?
 - I. If the sequence $\{a_n\}$ converges to $\frac{1}{2}$, then the series $\sum a_n$ converges.
 - II. If $\sum a_n$ and $\sum b_n$ both converge, then $\sum (a_n b_n) = (\sum a_n) (\sum b_n)$
 - III. If the series $\sum a_n$ converges, then the sequence $\{a_n\}$ also converges.
 - A. I. only
 - B. II. only
 - C. III. only
 - D. I. and III.
 - E. II. and III.

2. (7 points) For what values of p does the integral

$$\int_{e}^{\infty} \frac{1}{x(\ln x)^p} \, dx$$

converges?

- A. For $p \neq 0$
- B. For p < 0
- C. For p > 1
- D. For |p| < 1
- E. For all p

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3. (7 points) The masses m_i are located at the points P_i . Find the moment M_x .

$$m_1 = 2, m_2 = 5, m_3 = 3; P_1(2, -3), P_2(-3, 1), P_3(3, 5)$$

- A. -10 B. -2 C. 0
- D. 14
- E. 30

4. (7 points) Find the limit of the following sequence if it converges.

$$a_n = n\sin(\pi/n)$$

- A. -1
- B. 0
- C. 1
- D. π
- E. The sequence does not converge.

5. (14 points) The curve $y = \frac{1}{4}x^2 - \frac{1}{2}\ln x$ is rotated about the *y*-axis for $1 \le x \le 2$. Find the area of the resulting surface.

6. (8 points) Set up, but do not evaluate, an integral to find the exact length of the curve $y = \ln(\cos x)$ for $0 \le x \le \pi/3$. Simplify your integrand as much as possible.

7. (6 points) Let $a_n = f(n)$. Then the conclusion to the integral test is that the series $\sum_{n=1}^{\infty} a_n$ is convergent if and only if $\int_1^{\infty} f(x) dx$ is convergent. What are the three assumptions for the function f?

2.

3.

^{1.}

Midterm Exam 2

8. (16 points) Determine whether the series

$$\sum_{k=2}^{\infty} \frac{\ln k}{k^2}$$

converges. Fully justify your answer, including why any tests for convergence/divergence you use are valid.

9. (14 points) Determine whether the series

$$\sum_{k=0}^{\infty} \frac{\sqrt[5]{k}}{\sqrt[5]{k^7 + 3k + 4}}$$

converges. Fully justify your answer, including why any tests for convergence/divergence you use are valid.

10. (14 points) Consider the series

$$\sum_{n=0}^{\infty} \frac{(x-3)^n}{7^{2n}}.$$

(a) (7 points) Find the values x for which the series converges.

(b) (7 points) Find the sum of the series for those values of x.