NAME: __________________________________________
(Please Print)

Circle your discussion 11am 12pm 1pm 2pm 3pm

DIRECTIONS:

• Sit in the seat indicated. DO NOT OPEN YOUR EXAM UNTIL YOU ARE TOLD TO DO SO!

• Each exam is worth 100 points and has a total of 7 pages.

• No work means no points.

• This is a closed book, closed notes exam. No calculators allowed.

• No hats or dark sunglasses.

• No cell phones. Turn them OFF now. If you are seen with a cell phone in hand during the exam or if your cell phone is heard, it will be considered cheating and you will be asked to leave.

• No other electronic devices – MP3 players, PDAs, etc. Same rules as phones.

• If you have a question, raise your hand and a proctor will come to you. Once you stand up, you are done with the exam. You will not be permitted to leave the room and return during the exam.

• Be sure to write your proper name CLEARLY and circle the discussion section for which you are registered.

• If you finish early, quietly and respectfully get up and hand in your exam. You need to show a picture ID with a clear picture when you turn in your exam.

• When time is up, you will be instructed to put down your writing utensil and close your exam. Anyone seen continuing to write after this announcement will have their exam marked and will lose all points for the page on which they are writing.
SCORES:

1. ___________ /8
2. ___________ /16
3. ___________ /12
4. ___________ /28
5. ___________ /8
6. ___________ /12
7. ___________ /8
8. ___________ /8

Total: ___________ /100
Formulas:

- $\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$
- $\sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}$
- $\sum_{i=1}^{n} i^3 = \frac{n^2(n+1)^2}{4}$
- $\sum_{i=1}^{n} i^4 = \frac{n(n+1)(2n+1)(3n^2+3n-1)}{30}$
- $\sum_{i=1}^{n} i^5 = \frac{n^2(n+1)^2(2n^2+2n-1)}{12}$
Problem 1. (8 point)
Find all functions $f$ that satisfy the given conditions.
$f''(x) = \cos x - \frac{2}{x^2}$. 
Problem 2. (16 points)
a) (6 points) State the definition of the Riemann Sum for the (signed) area under the curve $y = f(x)$ on $[a, b]$.

b) (10 points) From the definition of area under the curve, find the signed area under the curve $y = x^2 + 2x + 1$ on $[0, 4]$. 
Problem 3. (12 points)
a) (6 points) State the Integral Mean Value Theorem with all hypotheses.

b) (6 points) Draw a picture that explains the conclusion of the Integral Mean Value Theorem.
Problem 4. (28 points)
Evaluate the following.

a) (7 points) \( \int (4e^u + \sec^2 u - \csc^2 u) \, du \).

b) (7 points) \( \int_0^1 \frac{y^2}{\sqrt{y^3 + 1}} \, dy \).
c) (7 points) \( \int \frac{\sqrt{\ln t}}{t} \, dt. \)

d) (7 points) \( \int_{2}^{4} \frac{x\sqrt{x} + \sqrt{x}}{x^2} \, dx. \)
Problem 5. (8 points)
Compute the average value of \( f(x) = 3x^2 + 2x + e^x \) on \([0, 3]\).
Problem 6. (12 points)
a) (6 points) State one version of the Fundamental Theorem of Calculus with all hypotheses.

b) (6 points) The function $F(x)$ is defined by $F(x) = \int_{1}^{x^2 + x} \cos(e^t) \, dt$, find $F'(x)$. 
Problem 7. (8 points)
Find the signed area under the curve $y = \cos x - \sin x$ on $[0, 2\pi]$ using any method you find appropriate. Provide a fully simplified answer.
Problem 8. (8 points)

Evaluate the Riemann Sum \( \lim_{n \to \infty} \frac{1}{n} \sum_{i=1}^{n} e^{(i/n)}. \)
Extra Space:
Any work on this page will NOT be graded unless you indicate clearly in a problem that you have continued your work here and labeled the work clearly.