

Math 192 Sec S07N01 Test 3 – Apr 4 2007

name (printed)

student number

**I have read and understood
the instructions below:**

signature

Instructions:

1. No notes or books are to be used in this test. If you need scrap paper please ask and some will be provided.
2. A non-programmable, non-graphing calculator is permitted.
3. There are 6 pages (including this cover page) in the test. Justify every answer, and clearly show your work. Unsupported answers will receive no credit.
4. You will be given 50 minutes to write this test. Read over the test before you begin.
5. At the end of the test you will be given the instruction "Put away all writing implements and remain seated." *Continuing to write after this instruction will be considered as cheating.*
6. **Academic dishonesty:** Exposing your paper to another student, copying material from another student, or representing your work as that of another student constitutes academic dishonesty. Cases of academic dishonesty may lead to a zero grade in the test, a zero grade in the course, and other measures, such as suspension from this university.

Question	value	score
1	10	
2	10	
3	10	
4	10	
5	10	
Total	50	

Question 1 [10 points]

Compute the average value of $f(x) = \sqrt{x} \ln(x^2)$ over the interval $[1, e]$.

Question 2 [10 points]

Compute

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

Question 3 [10 points]

The present values of the following annuities are the same:

- (i) 100 dollars per year paid continuously for ten years and earning interest at an interest rate of 5% (compounded continuously);
- (ii) $40e^{0.02t}$ dollars per year paid continuously forever at an interest rate of r (again compounded continuously).

What is r ? (note that $r > 0.02$ in order for (ii) to yield a real number.)

Question 4 [10 points]

Solve the differential equation

$$\frac{dy}{dx} = xe^{x-y}, \quad y(1) = 0$$

to find $y(2)$.

Question 5:

A certain population grows at a rate which, at any time t , is directly proportional to $P(t)$, the size of the population. Here t is in years and $t = 0$ corresponds to the present.

(a)[7 points] If $P(0) = 1200$ while $P(5) = 7000$, write down the differential equation describing the population growth and solve it for $P(t)$.

(b)[3 points] Use your result from (a) to predict the population size in 20 years.