

Name:

PID:

Discussion Section - No:

Time:

TA's name:

Midterm 1, Math 10C - Lecture A (Winter 2007)

Duration: 50 minutes

Please close your books, turn your calculators off and put them away. You can use one page of notes. To get full credit you should support your answers.

1. Suppose that the random variable x corresponds to the amount of time needed by a student to complete an exam for which the maximum time allowed is one hour. The distribution of the completion times by the students is given by the density function

$$p(x) = \begin{cases} cx^4 & 0 \leq x \leq 1 \\ 0 & \text{otherwise} \end{cases}.$$

a. (3 points) Determine the value of c that ensures that $p(x)$ is a density function.

b. (2 points) Find the mean of this distribution.

#	Score
1	
2	
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4	
Total	

2.

a) (3 points) Find the quadratic Taylor polynomial approximating the function $f(x) = \sqrt{x}$ about $x = 1$.

b) (2 points) Suppose the Taylor polynomial of degree n for $f(x)$ about $x = 0$ is given by

$$p_n(x) = 1 + x + \frac{x^2}{2} + \frac{x^3}{3} + \frac{x^4}{4} + \cdots + \frac{x^n}{n}.$$

Find a general formula for the n th derivative $f^{(n)}(0)$.

3.

a)(3 points) Find the sum of the convergent series

$$-0.2 + 0.2^2 - 0.2^3 + 0.2^4 - 0.2^5 + \dots$$

b)(2 points) Find an x value satisfying the equation

$$\sum_{j=1}^{\infty} (-1)^j \frac{x^{2j}}{(2j)!} = -\frac{x^2}{2} + \frac{x^4}{4!} - \frac{x^6}{6!} + \dots = -2.$$

4. (5 points) You are traveling from San Diego to New York on a plane on a winter day. Before the take-off the pilot announces that your route is 3000 miles long. The weather conditions get gradually worse as you approach New York. The trip lasts 6 hours. If during each hour of this trip (except the first hour of the trip) your plane can take $\frac{2}{3}$ of the distance it takes during the previous hour, what is the distance traveled by your plane during the first hour? You don't need to calculate the powers of real numbers. (Hint: Express the total distance traveled at the end of each hour as a finite geometric series. The first term of the geometric series, the distance traveled during the first hour, is what you need to determine.)