

## Practice Test 2B for Calculus II, Math 1502, October 2, 2010

Name:

Section:

**Name of TA:**

This test is to be taken without calculators and notes of any sorts. The allowed time is 50 minutes. Provide exact answers; not decimal approximations! For example, if you mean  $\sqrt{2}$  do not write 1.414.... Show your work, otherwise credit cannot be given.

Write your name, your section number as well as the name of your TA on EVERY PAGE of this test. This is very important.

[illegible]

**Name:**

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**I:** (25 points) Decide whether the following series converge or diverge: State which kind of convergence test you are using.

a)

$$\sum_{k=0}^{\infty} \frac{k^k}{3^{k^2}}$$

b)

$$\sum_{k=1}^{\infty} k^{-(1+\frac{1}{k})}$$

c)

$$\sum_{k=2}^{\infty} \frac{k^k}{\sqrt{k!}}$$

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**II:** (25 points) a) Using the Taylor series for the function

$$\log(1 + x)$$

how many terms do you have to use in order to calculate  $\log(3/2)$  with an accuracy  $\frac{1}{1000}$ .

b) Find the Taylor series of the function

$$\left[ e^{-x^4} \right]^2.$$

c) Sum the series

$$\sum_{k=2}^{\infty} \frac{\left(\frac{5}{7}\right)^k}{k}$$

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**III:** (25 points) a) Find the interval of convergence of the power series

a)

$$\sum_{k=1}^{\infty} k^{10} (x-1)^k 3^{-k}$$

b)

$$\sum_{k=1}^{\infty} \left(1 + \frac{1}{k}\right)^k x^k$$

c) Suppose that the power series

$$\sum_{k=0}^{\infty} a_k (x-2)^k$$

converges at  $x = 4$ . Does  $\sum_{k=0}^{\infty} a_k$  converge. Does  $\sum_{k=0}^{\infty} k^4 a_k$  converge. Does it converge absolutely?

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**IV:** (25 points) Solve the initial value problems

a)

$$y'' + 4y' + 4y = 0, \quad y(0) = 0, \quad y'(0) = 1.$$

b) At a certain moment, a tank contains 100 liters of brine with a concentration 50 grams of salt per liter. The brine is continuously drawn off at a rate of 10 liters per minute and replaced by brine containing 30 grams salt per liter. Find the amount of salt in the tank at time  $t$  later.