Practice Test 1A for Calculus II, Math 1502, September 4, 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 $1.414\ldots$. 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.

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I: (25 points) Consider the function $f(x) = (16 + x)^{\frac{1}{4}}$
a) Find the 2nd order Taylor polynomial $P_2(x)$ for $f(x)$ and the remainder in Lagrange form.

b) Using the above result compute an approximate value, call it A, for $17^{1/4}$

c) Give an estimate on how accurate the value computed in b) approximates $17^{1/4}$, i.e., give a bound on

$$|17^{1/4} - A| .$$

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II: (25 points) Calculate the limits:
a)

$$\lim_{x \to 0} \frac{f(x)}{f^{-1}(x)}$$

Where $f(x)$ is a differentiable and invertible function with $f(0) = 0$ and $f'(0) = 4$.

b)

$$\lim_{x \to 0} \frac{x - \int_0^x [\cos(t)]^2 dt}{x^3}$$

c)

$$\lim_{x \to 0} \left(\frac{1}{\sin(2x)} - \frac{1}{\tan(2x)} \right)$$

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III: (25 points) a) Decide which of the following improper integrals exists and compute its values if it exists:

$$a)\quad \int_0^\infty e^{-x}\cos(x)dx\ , \qquad b)\ \int_0^\infty \frac{x}{1+x^2}dx$$

Use the comparison test to decide which of the following integrals exists:

$$c)\quad \int_0^\infty \frac{1}{[\sin(x)]^2+x^2}dx\ , \quad d)\ \int_0^\infty \frac{x^2}{\sqrt{1+x^6}}dx$$

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IV: (25 points) Which of the following series is convergent or divergent. Reason carefully!

a)

$$\sum_{k=1}^{\infty} \left(\frac{k+1}{k} \right)^{k^2}$$

b)

$$\sum_{k=0}^{\infty} \frac{1}{(k+2)(k+3)} \; .$$

c) Consider the convergent series

$$L = \sum_{k=0}^{\infty} \frac{1}{3^k}$$

Find the smallest n so that $0 < L - s_n < 10^{-3}$.