Math 251, 11:00 am Midterm 1 Home Version
F 22 Feb. 2008

Instructions: This is to be done on your own, without assistance from anyone else.

The instructions concerning answers (show work, exact values, correct notation, etc.) are the same as on the real midterms. Answers should be written on separate sheets of paper, stapled together. They must be written neatly and in a well organized way. Full details of work must be shown (more than normally expected on an exam or homework).

You must show that you have learned from the mistakes you made on the in class version(s) of Midterm 1. In particular, grading will be more severe than on an in class midterm. When you turn your answers in, you must also turn in your in class version of Midterm 1 (both of them if you are in the 11:00 section). I will be particularly harsh on notational and other mistakes that were made on the in class version(s) of Midterm 1 and are repeated in your solutions to these problems.

Grading: You can get up to half the difference between 100 and your in class Midterm 1 score (the appropriately adjusted score if you are in the 11:00 section).

1. (12 points/part) Find the exact values of the following limits, or explain why they do not exist:

(a) $\lim_{x\to 0} \dfrac{\sin(7x)}{17x}$.

(b) $\lim_{x\to\infty} \dfrac{x}{\sqrt{7x^2+1}}$.

2. (a) (7 points) State carefully the definition of the derivative of a function.

(b) (16 points) If $f(x) = \sqrt{11-x}$, compute the derivative $f'(2)$ *directly from the definition*. (You should check your answer using the differentiation formula, but no credit will be given for just using the formula.)

3. (12 points/part) Differentiate the following functions:

(a) $f(x) = \dfrac{a}{\sqrt{x}} - \dfrac{b}{x} - \dfrac{c}{x^2} - \dfrac{7}{71}$. ($a$, b, and c are constants.)

(b) $f(t) = \sqrt{e} - t^2 g(t)$, where g is a function such that $g'(x) = \sqrt[3]{3x^2-6} - 13$. (Your answer might involve the function g.)

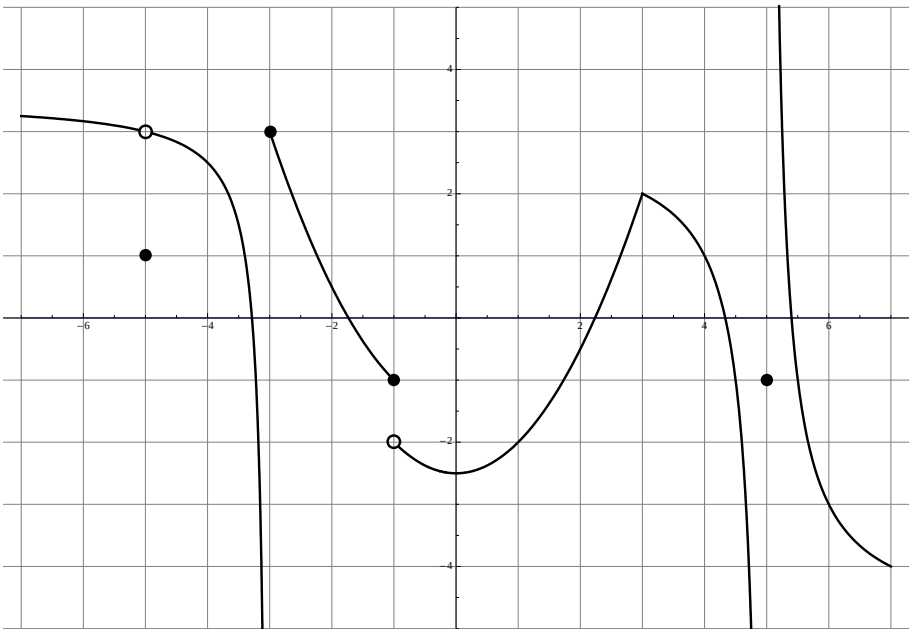
4. (15 points) Find the equation of tangent line to the graph of $f(x) = \dfrac{x}{e^x}$ at $x = -2$. You need not calculate the derivative directly from the definition. (Note that e might appear several places in the answer.)

5. (6 points) Express the following statement in terms of calculus. Be sure to define everything that appears in your formulas.

"The population of fire-breathing monsters on the planet Yuggxth was increasing throughout the period 1900–2000."

Continued on back or on next page.

6. (4 points/part) For the function $y = g(x)$ graphed below, answer the following questions:



(a) List all numbers a in $(-7, 7)$ such that g is not continuous at a. Give reasons.

(b) List all numbers a in $(-7, 7)$ such that g is continuous at a but not differentiable at a. Give brief reasons.