Problems for the televised review for Cal. 135 final exam F2008.

NOTE: This is only a review! Don't assume that the exam problems will be like those ones!

1. Find the derivative of the function $f(x) = \cos x^{\sin x}$.

2. Let $F(x) = xe^{x^2}$.

(a) Evaluate $\int_{-2}^{5} F(x)dx$

(b) Find the total area of the region bounded by the graph of $F(x)$, the x-axis, $x = -2$ and $x = 5$.

(c) Explain the answer for (a) and (b) are different.

3. Use differentials or linear approximation to approximate the value of $\frac{2}{\sqrt{3.99}}$.

4. Sketch the graph of the function $\frac{\ln x}{x}$.

You must find the domain, all asymptotes, where the function is increasing/decrasing, where it is concave up/dowm, all local min./max. and all points of inflection.

5. Approximate the area of the region that is bounded by the graph of the function $f(x) = x^2 + x$ on the interval [0.6], using Riemann sum with 3 equal subintervals. Take the representative points to be the midpoint of each subinterval.

6. Compute the derivative of $\int_{x^2}^{2} 3e^t dt$ twice: directly and then by using the Fundamental Theorem of Calculus Part 2.

7. Find the function f such that $f"(x) = \sin(2x), f'(0) = 3$ and $f(0) = 2$.

8. Find the dimensions of the largest area rectangle that can be inscribed in the region under the parabola $4 - x^2$ and above the x-axis.

9. Two circles have the same center. The inner one has radius r which is increasing at the rate of 2 inches per second. The outer circle has a radius R which is decreasing at the rate of 3 inches per second. Let A be the area of the region between the circles. At a certain time, r is 10 inches and R is 15 inches. How fast is A changing at this time? Is it increasing or decreasing?

10. $f(x)$ is a continuous and differentiable function on the interval $[-2, 2]$. Here are some values of the function: $f(-2) = 3, f(-1) = 2, f(0) = -3, f(1) = 2$ and $f(2) = -3$.

(a) How many solutions does the equation $f(x) = 0$ have?

(b) How many solutions does the equation $f'(x) = 0$ have?

In each (a) and (b) indicate the theorem you are using.

11. Compute the derivative of $\frac{1}{x-2}$ from the definition.

12. Evaluate $\lim_{x\to 0} \frac{\tan 3x}{\tan 4x}$ twice: first by avoiding L'Hospital Rule and then by using it.

13. Find $\lim_{x \to 1} \dfrac{|x^2 - 1|}{x - 1}$.

14. A ticket for a R.E.M. show costs \$350 each. At this price, 200 tickets will be sold. A survey shows that for each \$5 discount, 10 additional tickets will be sold. Find the ticket price for maximum revenue. At this price, find how many tickets will be sold and the revenue.