Final Review Problems. LAST WEEK of...

Problem 1. TO DO AGAIN. Question of continuity invoving the “squeezing lemma’

.

Example: A function $f(x)$ satisfies $1 \leq f(x) \leq e^x$. What can you say about the continuity of f at $x = 0$?

Problem 2. DONE. A question involving Newton iteration and using the linear (tangent line) approximation.

Example: set up the Newtion iteration scheme for finding the square root of some given integer.

Problem 3. DONE. [3/5] . A question involving the fundamental theorem of calculus.

Example: differentiate $G(x) = \int_1^{x^2} s \log(s) ds$

Problem 4. DO TODAY, 3/15. A question on L'Hopital's rule. (You could also use 2nd order Taylor expansions.)

Example. Compute $\lim_{t \to 0+} \frac{e^t + e^{-t} - 2}{t^2}$.

Problem 5. DONE: 3/9. A question involving implicit differentiation.

Example: A point (x, y) is constrained to move along the ellipse given by the equation $x^2 - xy + 4y^2 = 4$.

A) Find an expression for dy/dx as a function of x and y.

B) Use your expression to find the two points on the ellipse at which the tangent lines are parallel to the line $y = x$.

PROBLEM 6. TO DO:A simple optimization problem. (Boxes; Sums fixed.)

PROBLEM 7. *** NOT ON TEST *** problem on exponential growth or decay.

PROBLEM 8. DONE: A fundamental theorem of calculus question of the type given last week. I draw the graph of a function f which is the sum of step functions and piecewise linear functions. You draw the graph of $\int_0^x f(s)ds$.

Example: Graph $\int_0^x f(s)ds$, for $x \geq 0$, when

$f(x) = 1$ for $0 < x < 2$, $f(x) = 0$ for $2 < x < 4$ and $f(x) = -x + 4$ for $x > 4$.

PROBLEM 9. TO BE DONE. A graphing problem.

Example: Graph some functions of the form $f(x) = Ax^a + Bx^{-b}$ for $x > 0$. For various exponents a, b, find values of the parameters A, B which guarantee a critical point exists in the positive quadrant (I.e the region $x > 0$ and $y > 0$ of the plane. Locate this critical point.

PROBLEM 10. TO DO AGAIN. A problem involving the method of bisection *** and / OR the intermediate value theorem.