Exam #3 · Thursday, November 6, 2008

MATH 124 · Calculus I · Section 26 · Fall 2008 Name _____

Problem 1. Consider the following table of values of a function f and its first two derivatives.

x	-3	-1	1	3	5
$f(x)$	3.0	4.0	5.0	8.0	9.0
$f'(x)$	1.0	0.0	0.5	1.0	0.3
$f''(x)$	-2.0	0.0	1.4	0.0	-0.4

Furthermore, f' and f'' have no zeroes other than the ones shown.

Part (a). Does f have a critical point at $x = -1$? Why or why not?

Part (b). Does f have a local maximum at $x = -1$? Why or why not?

Part (c). Does f have an inflection point at $x = 3$? Why or why not?

Problem 2. Consider the curve

$$\ln(xy) = 2x.$$

Part (a). Find dy/dx.

Part (b). Find an equation for the tangent line the curve at the point $(x, y) = (1, e^2)$.

Problem 3.
Part (a). Find B so that

$$G(x) = B2^x + 2^{-x}$$

has a critical point at $x = -1$.

Part (b). Is this critical point a minimum, maximum, or neither? Explain your reasoning.

Problem 4. For each of the following, does the limit exist? If so, what is it, and why? If not, why not?

Part (a). $\lim_{t\to 0} \frac{1-\cosh t}{t^2}$

Part (b). $\lim_{z\to 0} \frac{3^z}{z^3}$

Problem 5. The east and west sides of a rectangular enclosure cost \$50 per meter; the north and south sides cost \$80 per meter. Find the dimensions of the enclosure with least cost enclosing an area of 1000 square meters.

Problem 6. The trajectory of an orbiting object is described by

$$r(1 + 0.2\cos(\theta)) = 10.$$

(The units of r are thousands of kilometers, or megameters if you like, and the units of θ are radians.) Find $d\theta/dt$ when $\theta = \pi/3$, given that $dr/dt = -20$ megameters per hour when $\theta = \pi/3$. Compute your answer to three decimal places.