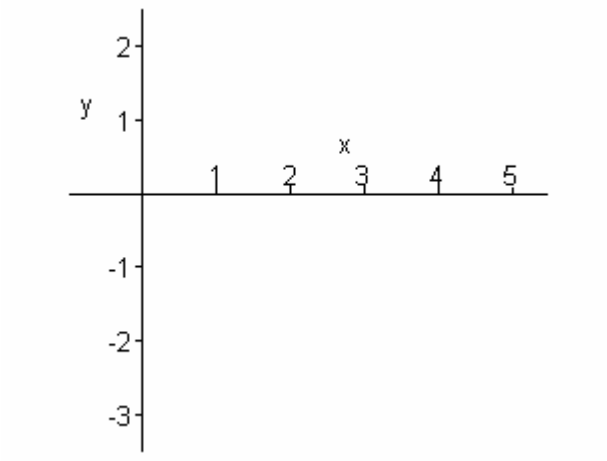
4/6/2006 MA 261 Calculus I Name:_____
Dr. Lunsford Test 2 (100 Points Total)

I. Below you are given the graph of a function f on the interval $[0,5]$. Please answer the following questions. (15 points total)



(a) Clearly indicate all critical points of f on the graph. (3 points)

(b) f has a global maximum value of _____ at $x =$_____ (4 points)

(c) The point $(1,-2)$ is a (circle one): (2 points)

global maximum global minimum

local maximum local minimum none of these

(d) For the remaining questions, please write "true" or "false", according to which is correct about the statement, in the space provided next to each statement. (2 points each – 6 total)

_____ f is continuous on $[0,5]$. _____ f is differentiable on $[0,5]$.

_____ $f'(3) > f'(4)$

II. Find the indicated derivatives. You *should simplify your answers*. Very little partial credit will be given on these problems. Clearly indicate your answers. (4 points each – 28 points total)

(a) $f(x) = \dfrac{1}{3x^5}$, $f'(x) = ?$

(b) $g(t) = \cos(3t)$, $\dfrac{d}{dt}g(t) = ?$

(b) $y = \arctan(3x)$, $\dfrac{dy}{dx} = ?$

(c) $w = \ln(u^2 + u + 1)$, $\dfrac{dw}{du} = ?$

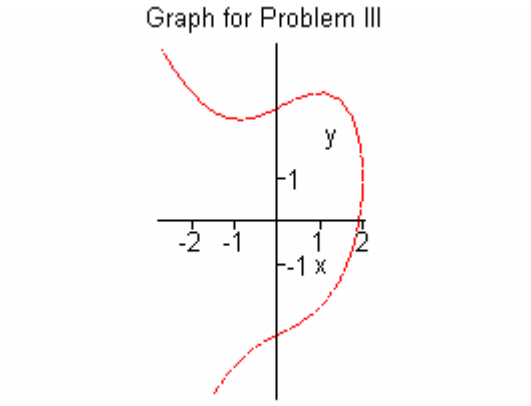
(d) $h(x) = \dfrac{x^2}{x^2+1}$, $h'(x) = ?$

(e) $y = e^{4x}$, $\dfrac{dy}{dx} = ?$

(f) $f(x) = x\sqrt[4]{x^5}$, $f'(x) = ?$

III. Below you are given the graph of $x^3 - xy + y^2 = 7$. Find $\frac{dy}{dx}$ at the point indicated on the graph.

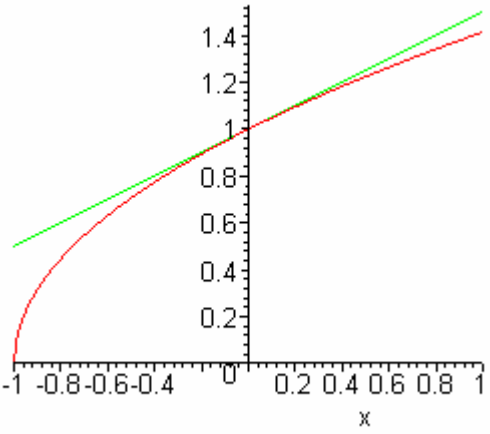
Note: The x coordinate of the point is 1. Neatly show all of your work. (7 points)



IV. Below you are given the graph of $y = \sqrt{x+1}$ and the tangent line to the graph at $x = 0$. Please answer the following: (9 points total)

(a) Find the equation of the tangent line. (4 points)

(b) What is your calculator approximation of $\sqrt{1.6}$ (please write this approximation to the accuracy of the display on your calculator. (2 points)



(c) Use the tangent line you found in part (a) to approximate $\sqrt{1.6}$. Graphically show the actual value of $\sqrt{1.6}$ and the tangent line approximation to $\sqrt{1.6}$ on the graph to your right. Note: Carefully choose the value of x to plug into the equation of the line! (3 points)

V. Find the global maximum and minimum values of the function $f(x) = x^3 - 6x^2 + 9x + 2$ on the interval $[-1, 2]$. Clearly indicate your answers. You must show all work to justify your answers. (7 points)

VI. More interesting derivatives. Please find the indicated derivatives. Do not simplify your answers. (6 points each – 24 points total)

(a) $y = (\ln x)^{\sin(2x)}$, $\dfrac{dy}{dx} = ?$

(b) $f(x) = e^{2x}\tan(3x)\sec(4x)$, $f'(x) = ?$

(c) $w(t) = e^{\cos(2t)} + \cos(e^{2t})$, $\dfrac{dw}{dt} = ?$

(d) $g(x) = \dfrac{e^{1/x}}{1+x^2}$, $g'(x) = ?$

VII. An alley is bounded by two fences that are 5 feet apart. At time $t = 0$ we observe two alley cats slinking towards each other but on different fences (please see the drawing below). One cat is slinking at a rate of $\frac{1}{2}$ foot per second while the other cat is slinking at a rate of 1 foot per second. Please answer the following questions: (10 points total)

(a) If the cats are 13 feet apart at time $t = 0$ seconds, then how far apart are they at $t = 2$ seconds? (3 points)

(b) How fast is the distance between the cats changing at $t = 2$ seconds? (7 points)

BONUS: Hissing distance is reached when the cats are 6 feet apart. At what time will the cats reach hissing distance? (4 points)