

Exam 2, version B
Math 171.501
11/3/09

*An unsupported answer
is a wrong answer!*

Do not use l'Hôpital's rule on this test.

1. (15 pts.) Find $\frac{dy}{dx}$ if:
 - (a) $y = \sin^2(4x^3)$.
 - (b) $y = \frac{x}{\ln(3x+1)}$.
 - (c) $y = \arctan\left(\frac{1}{x}\right)$.
2. (10 pts.) A ten foot ladder rests against a vertical wall. The bottom of the ladder is being pulled away from the wall at a rate of 1 foot per second. How rapidly is the top of the ladder going down at the instant that the top of the ladder is 8 feet from the floor?
3. (10 pts.) Use definition of derivative (i.e., evaluate a certain limit as h tends to zero) to find $f'(x)$ if $f(x) = \sqrt{2x}$.
4. (5 pts.) Using logarithmic differentiation, find $\frac{dy}{dx}$ if $y = \frac{x^{(x+1)}(x^3+3x+2)^5}{\sqrt{x^2+4}}$.
5. (10 pts.)
 - (a) Using implicit differentiation, find $\frac{dy}{dx}$ if $x^2 + xy + 2y^2 = 7$.
 - (b) At what points on the curve $x^2 + xy + 2y^2 = 7$ is the tangent line horizontal?
6. (5 pts.) In using Newton's method to find a root of $f(x) = x^4 + x - 1$, if $x_0 = 0$, what does x_2 equal?

More problems on back!

7. (10 pts.) In 1990, the population of Maroon, TX, was 1200 people. In 2000, the population was 1500 people. Assume that the population is growing exponentially.
- What will the population be in the year 2010? (Leave your answer in terms of exponentials and/or logarithms)
 - When will the population reach 3000? (Leave your answer in terms of exponentials and/or logarithms)
8. (10 pts.) Find the linear and quadratic approximation to $f(x) = \sqrt{x}$ at $a = 4$.
9. (10 pts.) At what point(s) of the parameterized curve $x = t^2 + 1, y = 2t^3 - 3t$ is the tangent line parallel to the line $y = \frac{3}{2}x$?
10. (15 pts.) Use the following values:

$f(1) = 3$	$f(2) = 5$	$g(1) = 4$	$g(2) = 1$
$f'(1) = 2$	$f'(2) = 6$	$g'(1) = -3$	$g'(2) = -7$

- If $A(x) = f(g(x))$, what is $A'(2)$?
- If $B(x) = \sqrt{f(x) + 2g(x)}$, what is $B'(1)$?
- If $C(x) = g^{-1}(x)$, what is $C'(1)$?