Name: __________________________________________________________________________

Spring 2011
Instructor: Ellie Grano

Circle your discussion section:
12:30 in HSSB 1215 with Derek
2:30 in HSSB 1227 with Derek
4:30 in HSSB 1223 with Tim

Math 3A Midterm 2, August 29, 2011

Instructions: There are 7 questions on this exam. The exam is closed book and calculators are not allowed. Show all your work and keep it neat, if I can’t make it out it is wrong. You must use calculus to get full credit.

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(1) Suppose a particle moves along a straight line and its position is given by $s(t) = \frac{t}{t+4}$ inches after $t$ seconds.

(a) Find the velocity function.

(b) When is the particle at rest?
(2) Find the derivatives of each of the following functions of \( x \).

(a) \( e^x - 4x^2 + \pi e \)

(b) \( 2^{5x} \)

(c) \( \ln(\sin \sqrt{x}) \)

(d) \( \frac{x \ln(x)}{\tan(x)} \)

(e) \( e^{\arcsin(x)} \)
(3) Find the derivatives of each of the following functions of $x$.

(a) $x^x$

(b) $(\cos x)^{\ln x}$
(4) Find the equation of the tangent line to the curve \( x^2 + y^2 = 1 + y\sqrt{x^2} \) at the point (1, 1).
(5) If $xy = 1$ and $\frac{dx}{dt} = 3$, find $\frac{dy}{dt}$ when $x = 4$. 
(6) A ladder 20 ft long rests against a vertical wall. If the bottom of the ladder slides away from the wall at a speed of 3 ft/s, how fast is the angle between the top of the ladder and the wall changing when the angle is $\pi/6$ radians?
(7) Choose ONE of the following questions to answer. Circle the question you have chosen. Write your answer clearly. DO NOT answer more than one.

(a) If \( f(x) = x^5 + x \) and \( g(x) = f^{-1}(x) \), find \( g'(2) \). Show your work.

OR

(b) Let \( f(x) = \tan^{-1}(x) \). Find \( f'(x) \) in terms of \( x \). You must use implicit differentiation to receive credit.
(Extra Credit) If \( f(x) = (g(x))^2 \) and \( f'(0) = g'(x) \neq 0 \), find \( g(0) \). Show your work.