

MATH 408N PRACTICE MIDTERM 2

Name: _____

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TA session: _____

Show your work for all the problems. Good luck!

(1) (a) [5 pts] Use the limit definition of the derivative to calculate $f'(x)$, if $f(x) = \frac{1}{x}$.

(b) [5 pts] Use the known derivatives of $\sin(x)$ and $\cos(x)$, and whatever differentiation rules you like, to show that

$$(\sec(x))' = \sec(x) \tan(x)$$

(2) Calculate the derivatives of the following functions, using whatever rules you like. You do *not* need to simplify your answer, but it should be written only in terms of x !

(a) [5 pts] $f(x) = 5^{\sin(x)} + \tan^{-1}(x) + \ln(x)$.

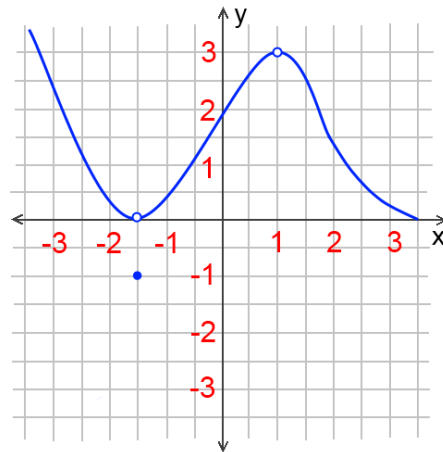
(b) [5 pts] $f(x) = \tan(x)^{x^2}$.

(3) Do the following questions:

(a) [5 pts] Find y' in terms of x and y , if we have that

$$e^{xy} + y^2 + y = x$$

(b) [5 pts] Let $f(x)$ be given in the following picture:



Find the absolute minimum and the absolute maximum of $f(x)$ on $[-2, 2]$. If either of these doesn't exist, justify why not.

- (4) [10 pts] A 20 foot ladder is sliding down the wall. When the bottom of the ladder is 12 feet from the wall, the top of the ladder is sliding down at 2 ft/sec. How quickly is the angle between the ladder and the ground changing at that instant?

(5) Do the following questions:

(a) [5 pts] Find the linearization of $f(x) = \sin^{-1}(x^2)$ at $x = 0$.

(b) [5 pts] Use the result from part (a) to estimate $\sin^{-1}(0.01)$.
Useful fact: $0.01 = 0.1^2$.