MATH 21, FALL, 2009, EXAM # 1 VER. 2.0

Name:____________________________________.

ID #____________________________________.

Section #____________________________________.

Instructor____________________________________.

TA____________________________________.

Instructions: All cellphones, calculators, computers, translating devices, and music players must be turned off.

Do all work on the test paper. ***Show all work***. You may receive no credit, even for a correct answer, if no work is shown. You may use the back if you need extra space. ***Do not*** simplify your answers, unless you are explicitly instructed to do so. This does not apply to evaluation of elementary functions at standard values or functional expressions, so that you **would** be expected to simplify $\sin(\pi/6)$ to $\frac{1}{2}$, for example. Do not write answers as decimal approximations; if $\sqrt{2}$ is the answer, leave it that way. *Except where explicitly stated otherwise, you can use the derivative rules and limit rules learned in class.*

You may **not** use a calculator, computer, the assistance of any other students, any notes, crib sheets, or texts during this exam.

You have 60 minutes to complete this exam.

Do not turn to the next page until you are instructed to do so.

Grading:

1.____________/25	5.____________/5
2.____________/25	6.____________/15
3.____________/10	7.____________/10
4.____________/10	

Total.____________/100

(1) Find the indicated limits: Show the steps involved. *(5 points/part)*

(a) $\lim_{x\to 2} \dfrac{x^2-3x+2}{x^2+x-6}$

(b) $\lim_{x\to\infty} \sqrt{x^2+2x-1} - x$

(c) $\lim_{t\to 0} \dfrac{\sqrt{2-t}-\sqrt{2}}{t} =$

(d) $\lim_{x\to 0} \dfrac{\tan(4x)}{\tan(3x)}$

(2) Find the following derivatives, using the rules we have discussed in class. *(5 points/part)*

(a) $\left((x^2+2x-3)(x^3-5)\right)' =$

(b) $\left(\dfrac{2x+3}{x^2-1}\right)' =$

(c) $\left(\sin(x)\left(x^3+4x\right)\right)' =$

(d) If $f(x) = e^{2x+3}$, then $f'(x) =$

(3) For the function $f(x) = \frac{2x+3}{x^2-1}$, find the vertical and horizontal asymptotes, and use those to make a rough sketch of the graph of $y = f(x)$.

(4) Show, using and ϵ-δ argument, that $\lim_{x\to 2} x^2 + x = 6$.

(5) Let

$$f(x) := \begin{cases} x^2, & \text{if } x \le 2 \\ mx+6, & \text{if } x > 2 \end{cases}.$$

Find the values of b for which the function f will be continuous at $x = 2$. *(5 points)*

(6)

(a) State the definition of the derivative of a function $f(x)$ (as a limit):
$f'(x) =$

(b) Use this definition to determine $f'(x)$, for the function $f(x) = \dfrac{1}{x^2}$.

(7) Suppose that $f(x)$ and $g(x)$ are differentiable functions so that $f(1) = 1$, $f'(1) = 4$, $f(4) = -3$, $f'(4) = 1$, $f(5) = 3$, $f'(5) = 2$, $g(1) = 5$, $g'(1) = 4$, $g(2) = 1$, and $g'(2) = 3$. Find $\frac{d}{dx}\left[f(g(x))\right]\big|_{x=1}$. *(5 points)*