Name ____

Homework #2, Math 151, Fall 2008

Instructions: Record final answers and attach pages with work. All work must be shown in order to receive credit. Exact values should be use unless stated otherwise.

1. Find the vertical asymptotes of the function.

   a. $f(x) = \dfrac{4x^2 + 4x - 24}{x^4 - 2x^3 - 9x^2 + 18x}$

   b. $g(x) = \ln(x^2 - 4)$

   c. $h(x) = \dfrac{e^{2(x+1)} - 1}{e^{x+1} - 1}$

2. Find the limit.

   a. $\lim\limits_{x \to \frac{\pi}{2}^+} \ln|\sin x|$

   b. $\lim\limits_{x \to 1} \left[\dfrac{x^2 + 1}{x^2 - 2x + 1} \right]$

3. Find the limit.

   a. $\lim\limits_{x \to \infty} \left(\dfrac{3 - 2x}{3x^3 - 1} \right)$

   b. $\lim\limits_{x \to \infty} \left(\dfrac{5x^{3/2}}{4x^{3/2} + 1} \right)$

   c. $\lim\limits_{x \to -\infty} \left(\dfrac{x}{\sqrt{x^2 + 1}} \right)$

d. $\lim_{x\to\infty}\left(\dfrac{8}{4-10^{-x/2}}\right)$

e. $\lim_{x\to\infty}\operatorname{arcsec}(x+1)$

4. Sketch the graph of the equation using intercepts, vertical and horizontal asymptotes, symmetry, etc. Label everything that applies.

$$y=\frac{x}{\sqrt{x^2-4}}$$

5. Find the derivatives of the functions by the limit process.
   a. $f(x)=3x+2$

   b. $g(x)=x^3+x^2$

   c. $h(x)=4\sqrt{x}$

   d. $k(x)=\dfrac{1}{x+1}$

6. Find the tangent line to the curve $f(x)=\dfrac{1}{x+1}$ at the point (0,1).

7. For the function $f(x) = \frac{1}{4}x^3$, find $f(2)$ and $f(2.1)$. Use the results to approximate $f'(2)$. Compare the result to the actual value by using the limit process to find the derivative.

Note: for #5 and #7, if you know the shorter process for finding derivatives which we'll learn in 3.2, you may use it to check your work but you will not receive credit for the problem if "limit definition" is specified.

8. Find the derivatives of the following functions.

a. $f(x) = \dfrac{x^3 - 3x^2 + 4}{x^2}$

b. $g(x) = 3x(6x - 5x^2)$

c. $h(x) = \dfrac{2}{\sqrt[3]{x}} + 5\cos x$

d. $k(s) = 3e^{s+1} - \tan \pi$

9. Find a and b such that f is differentiable everywhere.

$$f(x) = \begin{cases} \cos x, & x < 0 \\ ax + b, & x \geq 0 \end{cases}$$