MATH 124 C
Exam I
February 2, 2010

Name _____

Student ID #_____ Section _____

HONOR STATEMENT

"I affirm that my work upholds the highest standards of honesty and academic integrity at the University of Washington, and that I have neither given nor received any unauthorized assistance on this exam."

SIGNATURE:_____

1	12	
2	12	
3	8	
4	10	
5	8	
Total	50	

- Your exam should consist of this cover sheet, followed by five problems. Check that you have a complete exam.
- Show all work and justify your answers.
- Unless otherwise indicated, your answers should be exact values rather than decimal approximations. (For example, $\frac{\pi}{4}$ is an exact answer and is preferable to its decimal approximation 0.7854.)
- You may use a scientific calculator and one 8.5×11-inch sheet of handwritten notes. All other electronic devices (including graphing calculators) are forbidden.
- Turn your cell phone OFF and put it AWAY for the duration of the exam.

GOOD LUCK!

1. (12 points) Evaluate the following limits. Each answer should be either a number, ∞, $-\infty$, or "does not exist." If the limit does not exist, explain why.

   (a) $\lim_{x\to 2} \dfrac{x^2+2x-8}{x^2-5x+6}$

   (b) $\lim_{z\to 1^+} \dfrac{2z-3}{z^2-1}$

   (c) $\lim_{x\to \pi} \left[\sin\left(\dfrac{x}{2}+\sin x\right)\right]$

   (d) $\lim_{x\to 2} f(x)$ if $f(x) = \begin{cases} 6-x & \text{if} x \le 2 \\ \frac{x^2-4}{x+3} & \text{if} x > 2 \end{cases}$

2. (12 points) Use derivative rules to compute the derivative of each of the following functions. (You do not need to simplify your answers.)

   (a) $y = x^3 e^x$

   (b) $f(x) = \dfrac{e^{10x}}{x^2 + x - 2}$

   (c) $y = 4\sin(x) - \dfrac{1}{x} + \dfrac{5}{x^3}$

   (d) $g(x) = \tan(x^2)$

3. (8 points) Sketch the graph of a function $F(x)$ with ALL of the following properties:

   - $\lim_{x \to -\infty} F(x) = -3$;
   - $\lim_{x \to -2^-} F(x) = +\infty$;
   - $F(-2) = 4$;
   - $\lim_{x \to -2^+} F(x) = 1$;
   - $\lim_{x \to 4^-} F(x) = -\infty$;
   - $\lim_{x \to 4^+} F(x) = +\infty$; and
   - $\lim_{x \to +\infty} F(x) = 5$.

4. (10 points) Let $f(x) = \dfrac{2x}{x+1}$.

   (a) Give the equations of the vertical and horizontal asymptotes of $f(x)$.

   (b) Use the definition of the derivative

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

   to compute $f'(x)$. (No credit will be given for using the derivative rules.)

5. (8 points) Let $g(x) = x^2 + 6$. Find all values of a such that the line tangent to $g(x)$ at $x = a$ has x-intercept -2.