Name: _____   _____ / 20

There are 20 points possible on this quiz. No aids (book, calculator, etc.) are permitted. Show all work for full credit.

1. **[4 points]**

   a. Why is the following not a true statement? $\dfrac{x^2+x-6}{x-2}=x+3$

   b. Nevertheless, explain why the following equation is correct. $\displaystyle\lim_{x\to 2}\dfrac{x^2+x-6}{x-2}=\lim_{x\to 2}(x+3)$

2. **[4 points]** Compute the limit, if it exists. If the limit does not exist, explain why.

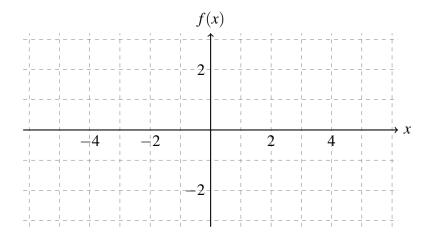 $\displaystyle\lim_{h\to 0}\dfrac{\sqrt{9+h}-3}{h}$.

3. **[4 points]** Compute the limit, if it exists. If the limit does not exist, explain why.

   $\displaystyle\lim_{x\to 6^-}\dfrac{2x-12}{|x-6|}$

4. [4 points] Consider the function $f(x) = \begin{cases} x^2 & x < -1 \\ x & -1 \le x < 1 \\ -\cos(\pi x) & x \ge 1. \end{cases}$

   a. In the diagram below, graph $f(x)$.

$$f(x)$$

   b. Determine whether or not $f(x)$ is continuous at $x = -1$ and explain your answer. You must use the <u>definition</u> of continuity in your explanation.

5. [4 points] Use the Intermediate Value Theorem to justify the claim that there exists a number x in the interval $(0, -2)$ satisfying $xe^x = x^2 - 1$. Explain your answer.