171 Name: _____

1. Find $\lim_{h\to 0} \dfrac{\sqrt{a+h}-\sqrt{a}}{h}$

2. Find $\lim_{x\to 3} \dfrac{\frac{1}{x}-\frac{1}{3}}{x-3}$

3. Let
$$f(x) = \begin{cases} x^2-1 & \text{if } x \le 2 \\ 1-x & \text{if } x > 2 \end{cases}$$
   (a) Find $\lim_{x\to 0} f(x)$
   (b) Find $\lim_{x\to 2^-} f(x)$
   (c) Find $\lim_{x\to 2^+} f(x)$
   (d) What does that tell you about $\lim_{x\to 2} f(x)$?
   (e) Is f continuous at 2?

4. Let
$$f(x) = \begin{cases} 2x-3 & \text{if } x \le 2 \\ x^2-2 & \text{if } x > 2 \end{cases}$$
   (a) Find $\lim_{x\to 2^-} f(x)$
   (b) Find $\lim_{x\to 2^+} f(x)$
   (c) What does that tell you about $\lim_{x\to 2} f(x)$?
   (d) Is f continuous at 2?

5. Let
$$f(x) = \begin{cases} x^2+x & \text{if } x < 3 \\ 2x+6 & \text{if } x > 3 \end{cases}$$
   (a) Find $\lim_{x\to 3^-} f(x)$
   (b) Find $\lim_{x\to 3^+} f(x)$
   (c) What does that tell you about $\lim_{x\to 3} f(x)$?
   (d) Is f continuous at 3?

6. Let

$$f(x) = \begin{cases} \frac{x^3-1}{x-1} & \text{if} \quad x \leq 1 \\ \frac{x^2+x-2}{x-1} & \text{if} \quad x > 1 \end{cases}$$

   (a) Find $\lim_{x \to 1^-} f(x)$

   (b) Find $\lim_{x \to 1^+} f(x)$

   (c) Find $\lim_{x \to 1} f(x)$?

   (d) Is f continuous at 1?

7. Find a so that

$$f(x) = \begin{cases} x^2 - 1 & \text{if} \quad x \leq 3 \\ ax + 5 & \text{if} \quad x > 3 \end{cases}$$

   Is continuous at 3

8. Suppose $\lim_{x \to 0} \frac{f(x)}{x} = 1$

   Find $\lim_{x \to 0} \frac{f(ax)}{x}$
   hint, muliply by $\frac{a}{a}$

9. Using a similar trick, find $\lim_{x \to 0} \frac{f(ax)}{f(bx)}$