**Honors Pre-Calculus – Section 12.1** Name______________________________
**Exploring Limits** Date ________________ Per. _________

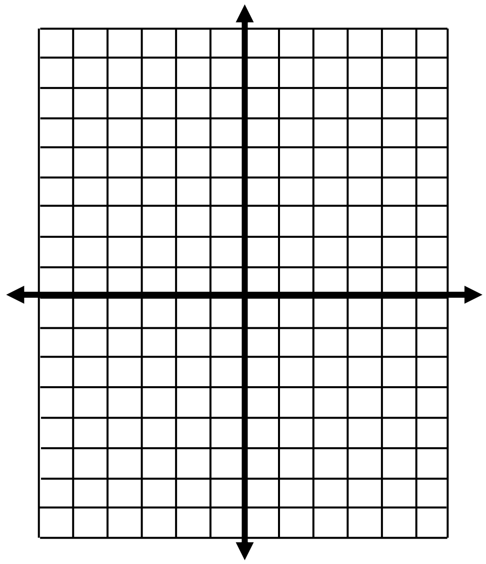
1. Evaluate the function at the indicated values and then plot the points and graph the graph. Then find the indicated limits.

$f(x) = 3x - 1$

$f(0) =$

$f(3) =$

$f(-2) =$



$\lim_{x \to 0}(3x - 1)$

$\lim_{x \to 3}(3x - 1)$

$\lim_{x \to -2}(3x - 1)$

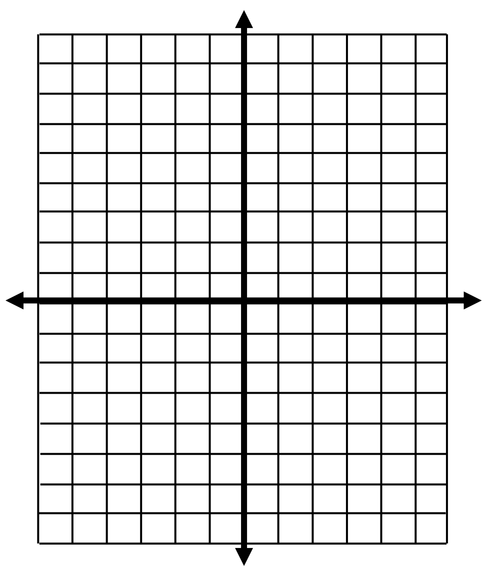
2. Evaluate the function at the indicated values and then plot the points and graph the graph. Then find the indicated limits.

$f(x) = x^2 - 4$

$f(0) =$

$f(2) =$

$f(-2) =$



$\lim_{x \to 0}(x^2 - 4)$

$\lim_{x \to 3}(x^2 - 4)$

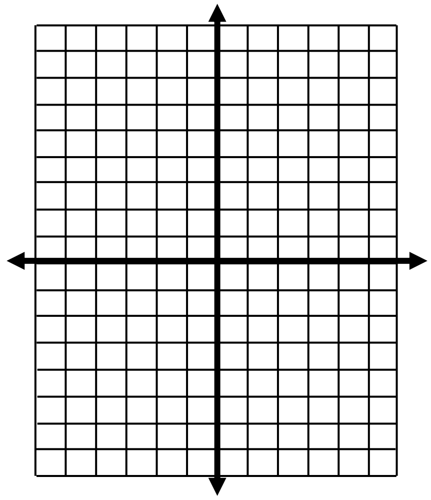
$\lim_{x \to -2}(x^2 - 4)$

**<u>Theorem: The Existence of a Limit</u>**

$\lim_{x \to c} f(x) = L$ iff $\lim_{x \to c^+} f(x) = \lim_{x \to c^-} f(x) = L$ (i.e. the right and left hand limits are the same). On the functions domain.

3. Graph the given function and then find the indicated limits.

$$y=\left(\frac{x^2-4}{x-2}\right)$$



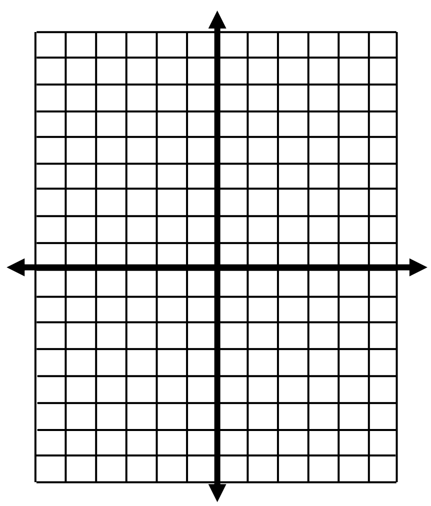
$$\lim_{x\to 0}\left(\frac{x^2-4}{x-2}\right)$$

$$\lim_{x\to 2}\left(\frac{x^2-4}{x-2}\right)$$

$$\lim_{x\to -2}\left(\frac{x^2-4}{x-2}\right)$$

4. Graph the given function and then find the indicated limits.

$$y=\left(\frac{x-2}{x^2-4}\right)$$



$$\lim_{x\to 0}\left(\frac{x-2}{x^2-4}\right)$$

$$\lim_{x\to 2}\left(\frac{x-2}{x^2-4}\right)$$

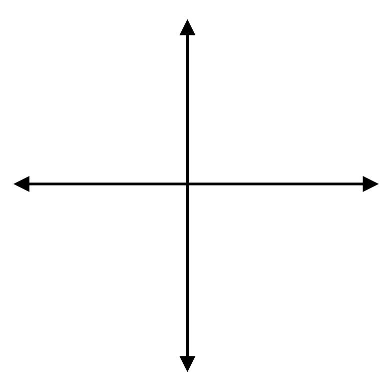
$$\lim_{x\to -2}\left(\frac{x-2}{x^2-4}\right)$$

$$\lim_{x\to \infty}\left(\frac{x-2}{x^2-4}\right)$$

5. Find the indicated limits by direct substitution verify graphically.

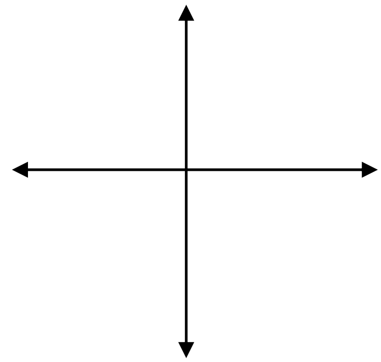
$$\lim_{x\to 0}\left(\frac{x^2+4x+3}{x+1}\right)=$$

$$\lim_{x\to -1}\left(\frac{x^2+4x+3}{x+1}\right)=$$



6. Find the indicated limits by direct substitution verify graphically.

$\lim_{x\to 0}\left(\frac{x-3}{x^2-x-6}\right)=$

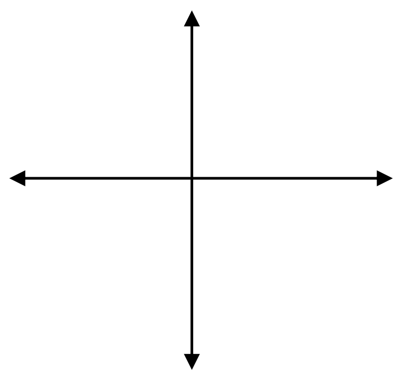


$\lim_{x\to 3}\left(\frac{x-3}{x^2-x-6}\right)=$

$\lim_{x\to \infty}\left(\frac{x-3}{x^2-x-6}\right)=$

7. Sketch the graph and analyze the limits at the indicated points

$$g(x)=\begin{cases} -x+5 & x\le 0 \\ x-1 & x>0 \end{cases}$$



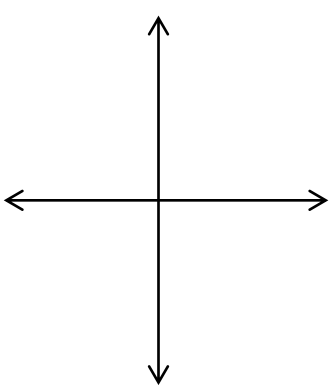
a. $\lim_{x\to -2} g(x)=$

b. $\lim_{x\to 3} g(x)=$

c. $\lim_{x\to 0} g(x)=$

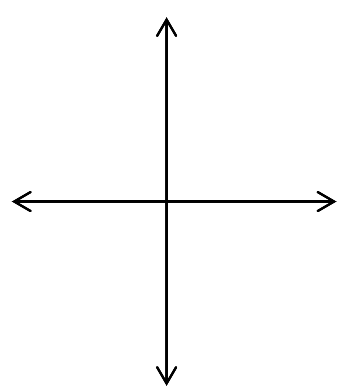
8) Graph $f(x)=\begin{cases} x^3-1, & x<1 \\ 2x-2, & x\ge 1 \end{cases}$

Find: $\lim_{x\to 1} f(x)=$



9) Graph $h(x)=\begin{cases} \sqrt{x+2}, & x\ge -2 \\ (x+2)^2, & x<-2 \end{cases}$

Find: $\lim_{x\to -2} h(x)=$



**<u>Definition of Continuity: ("The Continuity Test)</u>**

***Continuity at a Point***: A function f is **<u>continuous at c</u>** if the following three conditions are met.

1. $f(c)$ is defined.

2. $\lim_{x \to c} f(x)$ exists.

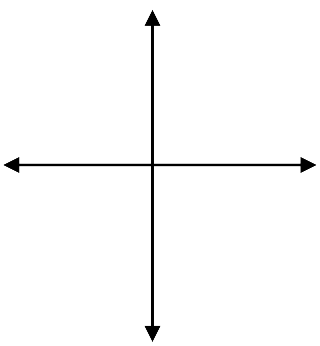
3. $\lim_{x \to c} f(x) = f(\text{c})$.

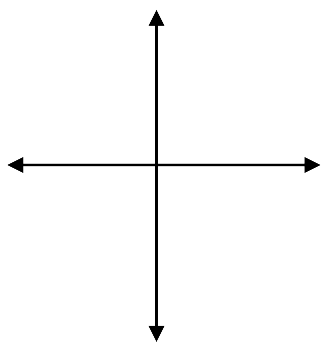
10. Sketch and determine which function is continuous at $x$ =1. Why?

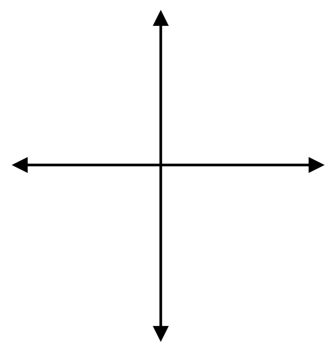
a. $g(x) = \dfrac{x^2 - 1}{x - 1}$

b. $h(x) = \begin{cases} x+1, & x \le 1 \\ 3x-1 & x > 1 \end{cases}$

c. $j(x) = \begin{cases} \dfrac{x^2-1}{x-1}, & x \ne 1 \\ 0 & x = 1 \end{cases}$



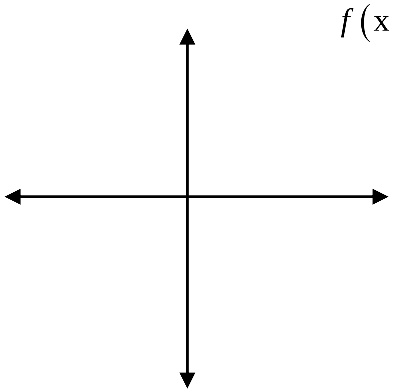




11. Sketch the following then apply the **continuity test** at the indicated point:

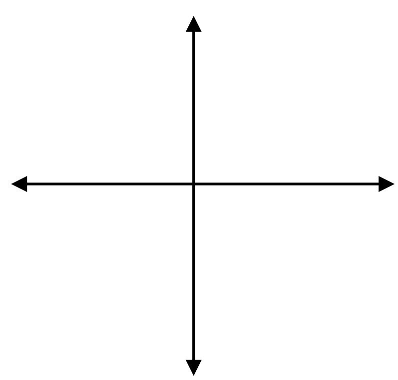
a. Apply the **continuity test** at x = 0.

$g(x) = \begin{cases} \text{-x+5} & \text{x} \le 0 \\ \text{x-1} & \text{x} > 0 \end{cases}$



b. Apply the **continuity test** at x = 1.

$f(\text{x}) = \begin{cases} x^3 - 1, & x < 1 \\ 2x - 2, & x \ge 1 \end{cases}$



12. Evaluate the following limits given the following: $\lim_{x\to c} f(x) = 27$ $\lim_{x\to c} g(x) = 12$

a. $\lim_{x\to c} \sqrt[3]{f(x)}$

b. $\lim_{x\to c} \frac{f(x)}{18}$

c. $\lim_{x\to c} \left[ f(x) \cdot g(x) \right]$

d. $\lim_{x\to c} \left[ f(x) - 2 \cdot g(x) \right]$

13. Evaluate the following limits:

a. $\lim_{x\to 1} \left( \frac{2x^2 - 5x - 3}{x - 3} \right) =$

b. $\lim_{x\to 6} \left( \frac{\frac{1}{5} + \frac{1}{x-5}}{x} \right) =$

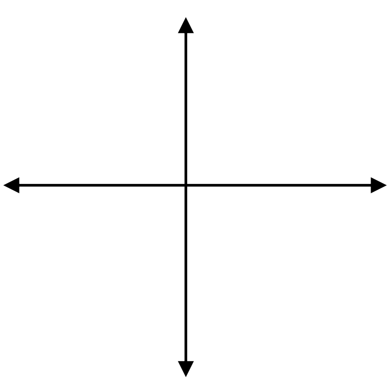
c. $\lim_{x\to 7} \left( \frac{\sqrt{x+9} - 3}{x} \right) =$

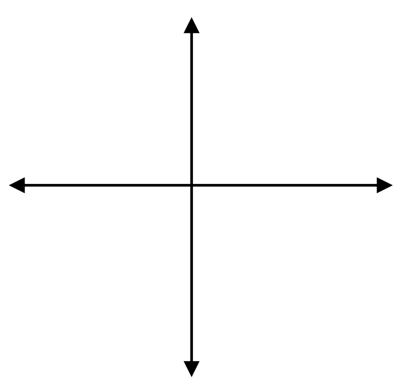
13. Find the limits by analyzing their graph on a calculator.

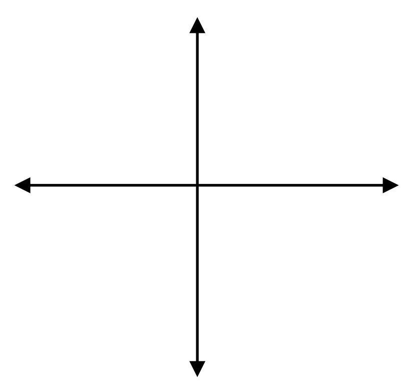
a. $\lim_{x\to 0} \left( \frac{|x|}{x} \right)$

b. $\lim_{x\to 0} \left( \frac{1}{x^2} \right)$

c. $\lim_{x\to 0} \left[ \sin \left( \frac{1}{x} \right) \right]$







**Honors Pre-Calculus – Section 12.2** **Name_______________________________**
**Evaluating Limits** **Date __________________ Per. ________**

1. Evaluate the following limits:

a. $\lim_{x\to 3}\left(\frac{x^2+11x+30}{x+5}\right)=$

b. $\lim_{x\to 1}\left(\frac{\frac{1}{3}-\frac{1}{x+3}}{x}\right)=$

c. $\lim_{x\to 7}\left(\frac{\sqrt{x+9}-3}{x}\right)=$

2. Evaluate the following:

a. $\lim_{x\to -5}\left(\frac{x^2+11x+30}{x+5}\right)=$

b. $\lim_{x\to 3}\left(\frac{x^2-x-6}{x-3}\right)=$

c. $\lim_{x\to 0}\left(\frac{\sqrt{x+9}-3}{x}\right)=$

d. $\lim_{x\to 0}\left(\frac{\sqrt{5-x}-\sqrt{5}}{x}\right)=$

e. $\lim_{x\to 0^{\pm}} f(x)$ where $f(x)=\left\{\begin{matrix} 2x+1 & if & x\geq 0 \\ 2x-1 & if & x<0 \end{matrix}\right\}$

f. $\lim_{x\to 0}\left(\frac{\frac{1}{3}-\frac{1}{x+3}}{x}\right)=$

g. $\lim_{x\to 0}\left(\frac{\frac{1}{4-x}-\frac{1}{4}}{x}\right)=$

**<u>Theorem: The Existence of a Limit</u>**

$\lim_{x\to c} f(x)=L$ iff $\lim_{x\to c^+} f(x)=\lim_{x\to c^-} f(x)=L$ (i.e. the right and left hand limits are the same)

3. Evaluate the following (by graphing)

a. $\lim_{x\to 0}\left(\frac{\sin x}{x}\right)=$

b. $\lim_{x\to 0}\left(\frac{1-\cos x}{x}\right)=$

4. Find $\lim_{h\to 0}\left(\frac{f(x+h)-f(x)}{h}\right)$ for the following:

a. $f(x)=3x+1$

b. $f(x)=x^2+2$