

Today's Plan:

Learning Target (standard): I will evaluate and describe one-sided limits.

Students will: Complete practice problems over previous concepts at the boards, put up homework problems on the board and make necessary corrections to their own work, take notes over new material and complete practice problems over new concepts.

Teacher will: Provide practice problems over previous concepts, check homework problems for accuracy and provide students feedback, describe and provide examples of new concepts and assign students assessment problems over new concepts.

Assessment: Board work, homework check and homework assignment

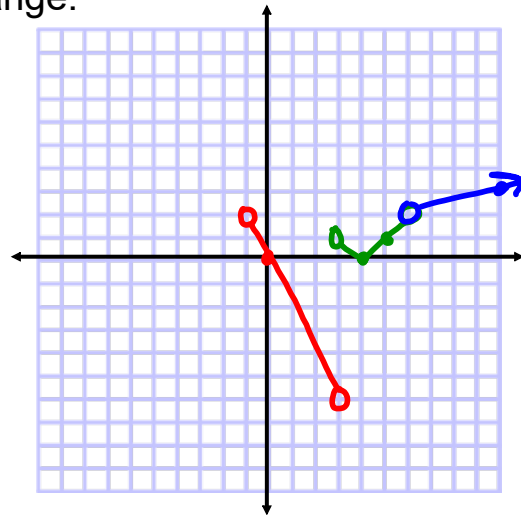
Differentiation: Students will work at the board, go over and correct homework at their seats, actively engage in lecture over new concepts, practice new concepts with the aid of other students and the teacher and complete homework assignment.

$$\begin{aligned}
 5) \lim_{x \rightarrow 3} \frac{\sqrt{x^2+7}-4}{x^2-3x} \cdot \frac{\sqrt{x^2+7}+4}{\sqrt{x^2+7}+4} \\
 &= \lim_{x \rightarrow 3} \frac{x^2+7-16}{x(x-3)(\sqrt{x^2+7}+4)} \\
 &= \lim_{x \rightarrow 3} \frac{x^2-9}{x(x-3)(\sqrt{x^2+7}+4)} \\
 &= \lim_{x \rightarrow 3} \frac{(x+3)\cancel{(x-3)}}{x\cancel{(x-3)}(\sqrt{x^2+7}+4)} \\
 &= \lim_{x \rightarrow 3} \frac{x+3}{x(\sqrt{x^2+7}+4)} \\
 &= \frac{3+3}{3(\sqrt{9+7}+4)} \\
 &= \frac{6}{3(8)} = \frac{6}{24} \\
 &= \frac{1}{4}
 \end{aligned}$$

$$\begin{aligned}
 \text{b) } \lim_{x \rightarrow 0} \left(\frac{1}{x\sqrt{x+1}} - \frac{1}{x} \right) &= \lim_{x \rightarrow 0} \left(\frac{1}{x\sqrt{x+1}} - \frac{\sqrt{x+1}}{x\sqrt{x+1}} \right) \\
 &= \lim_{x \rightarrow 0} \frac{1 - \sqrt{x+1}}{x\sqrt{x+1}} \cdot \frac{1 + \sqrt{x+1}}{1 + \sqrt{x+1}} \\
 &= \lim_{x \rightarrow 0} \frac{1 - (x+1)}{x\sqrt{x+1}(1 + \sqrt{x+1})} \\
 &= \lim_{x \rightarrow 0} \frac{-x}{x\sqrt{x+1}(1 + \sqrt{x+1})} \\
 &= \lim_{x \rightarrow 0} \frac{-1}{\sqrt{x+1}(1 + \sqrt{x+1})} \\
 &= \frac{-1}{\sqrt{1}(1 + \sqrt{1})} = -\frac{1}{2}
 \end{aligned}$$

Graph and find domain and range.

$$f(x) = \begin{cases} -2x, & -1 < x < 3 \\ |x - 4|, & 3 < x < 6 \\ \frac{1}{3}x, & x > 6 \end{cases}$$



$$\text{a) } \lim_{x \rightarrow 3} f(x) = \text{DNE}$$

$$\text{b) } \lim_{x \rightarrow 5} f(x) = 1$$

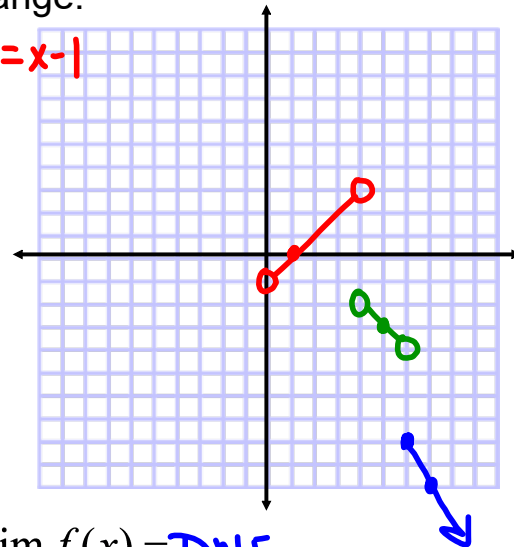
$$\text{c) } \lim_{x \rightarrow 6} f(x) = 2$$

$$\text{D: } \{ x \mid x > -1, x \neq 3, 6 \}$$

$$\text{R: } \{ y \mid y > -6, y \neq 2 \}$$

Graph and find domain and range.

$$f(x) = \begin{cases} \frac{x^2 - 1}{x + 1}, & 0 < x < 4 \\ 2 - x, & 4 < x < 6 \\ 4 - 2x, & x \geq 6 \end{cases}$$



$$a) \lim_{x \rightarrow 3} f(x) = 2$$

$$b) \lim_{x \rightarrow 2} f(x) = 1$$

$$c) \lim_{x \rightarrow 6} f(x) = \text{DNE}$$

$$D: \{x \mid x > 0, x \neq 4\}$$

$$R: \{y \mid y \leq -8, -4 < y < -2, -1 < y < 3\}$$

Evaluate:

$$\lim_{x \rightarrow -2} \frac{x^3 + 2x^2 - 1}{5 - 3x} = \frac{(-2)^3 + 2(-2)^2 - 1}{5 - 3(-2)}$$

$$= \frac{-8 + 8 - 1}{5 + 6}$$

$$= -\frac{1}{11}$$

Evaluate:

$$\begin{aligned}
 \lim_{x \rightarrow 0} \frac{\sqrt{x^2+9}-3}{x^2} & \cdot \frac{\sqrt{x^2+9}+3}{\sqrt{x^2+9}+3} \\
 &= \lim_{x \rightarrow 0} \frac{x^2+9-9}{x^2(\sqrt{x^2+9}+3)} \\
 &= \lim_{x \rightarrow 0} \frac{\cancel{x^2}}{\cancel{x^2}(\sqrt{x^2+9}+3)} \\
 &= \lim_{x \rightarrow 0} \frac{1}{\sqrt{x^2+9}+3} \\
 &= \frac{1}{\sqrt{9}+3} \\
 &= \frac{1}{6}
 \end{aligned}$$

Evaluate:

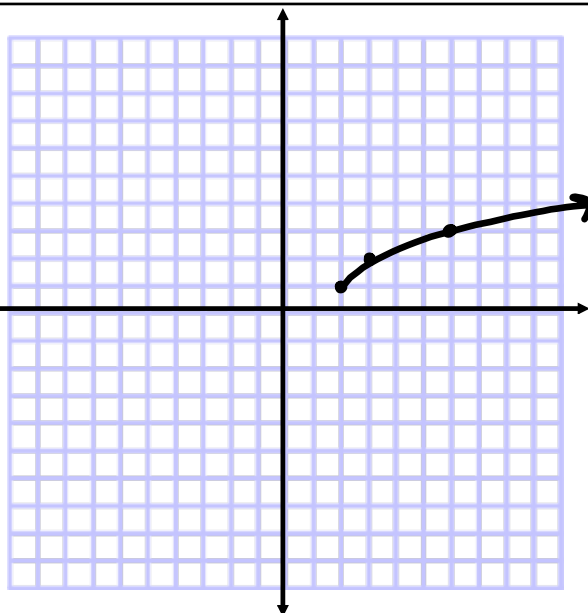
$$\begin{aligned}
 \lim_{h \rightarrow 0} \frac{(3+h)^2-9}{h} &= \lim_{h \rightarrow 0} \frac{9+6h+h^2-9}{h} \\
 &= \lim_{h \rightarrow 0} \frac{6h+h^2}{h} \\
 &= \lim_{h \rightarrow 0} (6+h) \\
 &= 6+0 \\
 &= 6
 \end{aligned}$$

Graph and evaluate the limits:

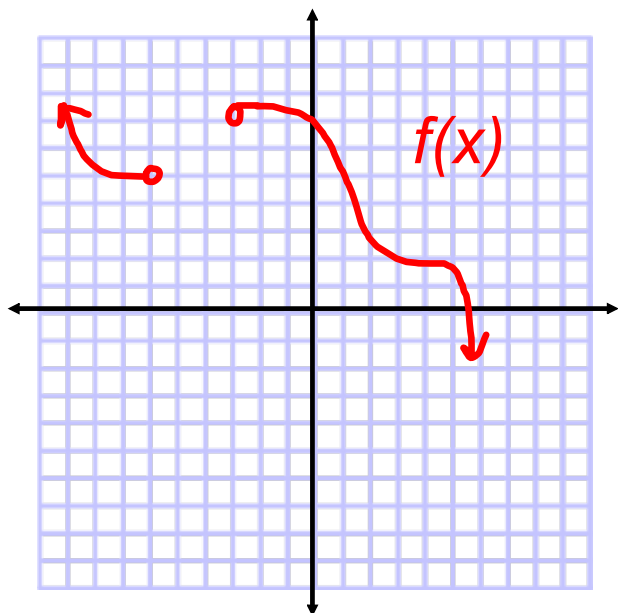
$$f(x) = 1 + \sqrt{x-2}$$

$$a) \lim_{x \rightarrow 2} f(x) = \text{DNE}$$

$$b) \lim_{x \rightarrow 4} f(x) = 1 + \sqrt{2}$$



Right-Hand Limits:



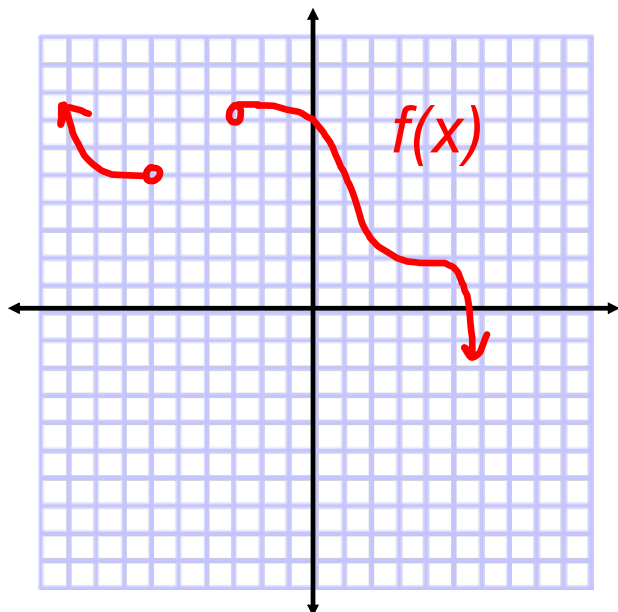
$$\lim_{x \rightarrow a^+} f(x)$$

$$\lim_{x \rightarrow 1^+} f(x) = 5$$

$$\lim_{x \rightarrow -3^+} f(x) = 7$$

$$\lim_{x \rightarrow -6^+} f(x) = \text{DNE}$$

Left-Hand Limits:



$$\lim_{x \rightarrow a^-} f(x)$$

$$\lim_{x \rightarrow 4^-} f(x) = 2$$

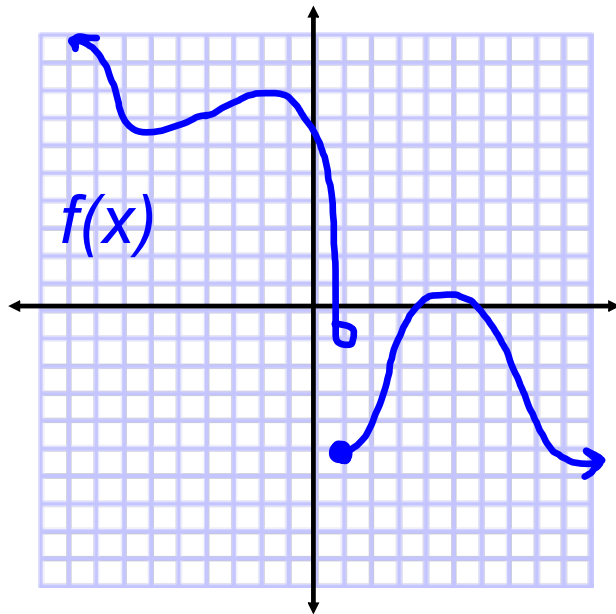
$$\lim_{x \rightarrow -3^-} f(x) = \text{DNE}$$

$$\lim_{x \rightarrow -6^-} f(x) = 5$$

In order for the general limit $\lim_{x \rightarrow a} f(x)$ to exist:

$$\lim_{x \rightarrow a^-} f(x) = \lim_{x \rightarrow a^+} f(x)$$

One-Sided Limits:



$$\lim_{x \rightarrow 1} f(x) = \text{DNE}$$

$$\lim_{x \rightarrow 1^-} f(x) = -1$$

$$\lim_{x \rightarrow 1^+} f(x) = -5$$

Evaluate the limits:

$$\lim_{x \rightarrow 4^-} (2 + \sqrt{x-4}) = \text{DNE}$$

$$\lim_{x \rightarrow 4^+} (2 + \sqrt{x-4}) = 2$$

$$\lim_{x \rightarrow 4} (2 + \sqrt{x-4}) = \text{DNE}$$

Assignment:

Worksheet "Assignment 5"

#1-14