

Unit #5: Limits

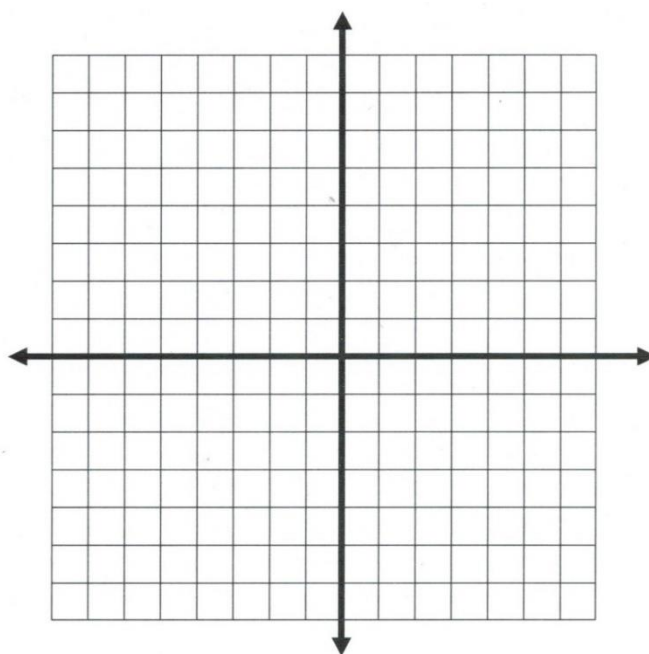
Topic: Finding Limits Algebraically

Objective: SWBAT find the limit of a function by using algebraic methods.

## Warm Up #3:

A *piecewise function* is a function that is defined in pieces by two or more equations over a given domain.

1) Graph the function:  $f(x) = \begin{cases} 2x + 1, & x \geq 1 \\ x^2 + 3, & x < 1 \end{cases}$



2) Using the graph above, find each of the following values:

a)  $f(-3) =$

b)  $f(1) =$

c)  $f(5) =$

3) Find each of the following limits:

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

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

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

## Finding Limits Algebraically

*The four-step process to solving limit problems algebraically:*

1) \_\_\_\_\_.

2) \_\_\_\_\_.

3) \_\_\_\_\_.

4) \_\_\_\_\_.

*Examples:* Find each of the following limits

a)  $\lim_{x \rightarrow -3} \frac{x^2 + x - 6}{x + 3}$

b)  $\lim_{h \rightarrow 0} \frac{(h-2)^2 - 4}{h}$

c)  $\lim_{x \rightarrow 3} \frac{\frac{1}{x} - \frac{1}{3}}{x - 3}$

d)  $\lim_{x \rightarrow 0} \frac{3 - \sqrt{9 - x}}{x}$

Problem Set #3: Find each of the following limits.

$$1) \lim_{x \rightarrow 7} \frac{7-x}{x^2-49}$$

$$2) \lim_{x \rightarrow 0} \frac{\frac{1}{3+x} - \frac{1}{3-x}}{x}$$

$$3) \lim_{x \rightarrow 2} \frac{x^2-4}{x^3+x^2-6x}$$

$$4) \lim_{x \rightarrow -3} \frac{\sqrt{x+7}-2}{x+3}$$

$$5) \lim_{x \rightarrow 2} \frac{2x-12}{x^3-6x^2+4x-24}$$

$$6) \lim_{x \rightarrow 0} \frac{5x^3+8x^2}{3x^4-16x^2}$$

$$7) \lim_{x \rightarrow 0} \frac{\frac{1}{x+1} - 1}{x}$$

$$8) \lim_{x \rightarrow 2} \frac{4 - \sqrt{18-x}}{x-2}$$

$$9) \lim_{x \rightarrow 2} \frac{x^2 - 4x + 4}{x^2 + x - 6}$$

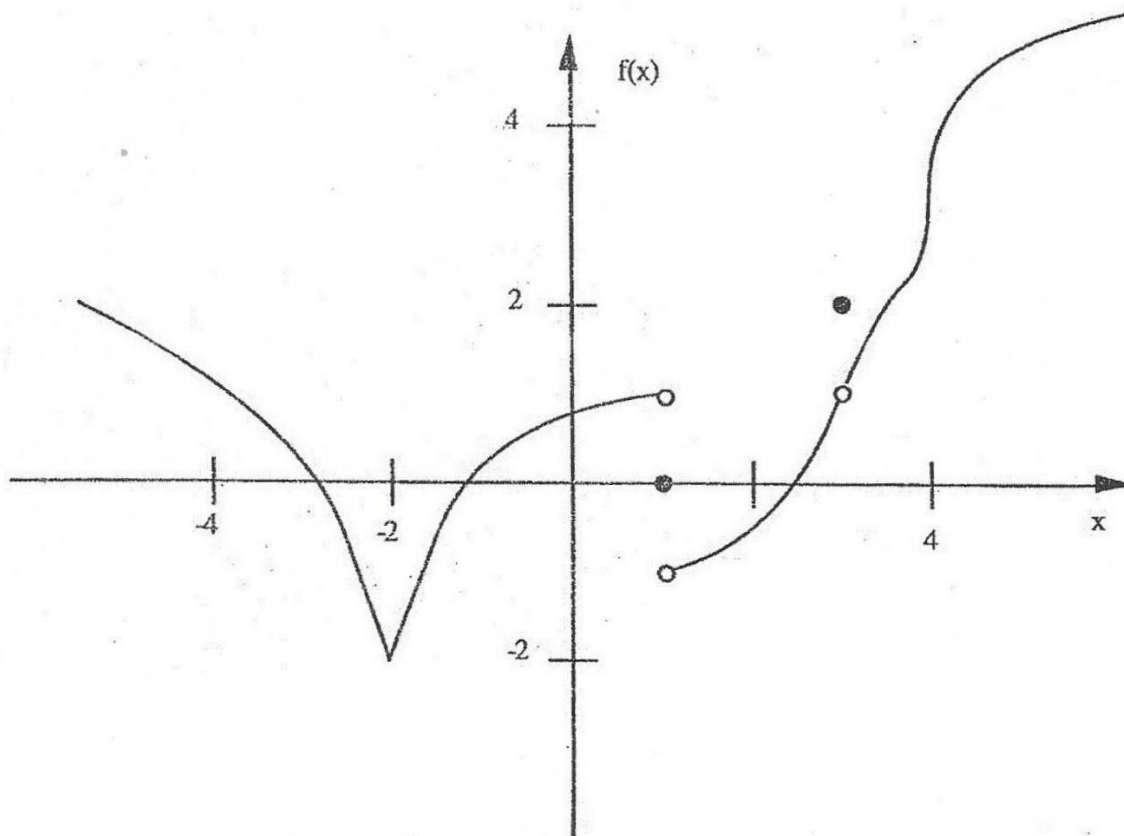
$$10) \lim_{x \rightarrow -1} \frac{x^2 + 6x + 5}{x^2 - 4x - 5}$$

$$11) \lim_{x \rightarrow 5} \frac{(x-5)^2}{x^2 - 25}$$

$$12) \lim_{x \rightarrow 0} \frac{(2+x)^3 - 8}{x}$$

**Review Problem:**

Given the graph of the following function.



Find the following:

- |                                    |                                    |                                    |
|------------------------------------|------------------------------------|------------------------------------|
| A) $f(1)$                          | B) $\lim_{x \rightarrow 1^-} f(x)$ | C) $\lim_{x \rightarrow 1^+} f(x)$ |
| D) $\lim_{x \rightarrow 1} f(x)$   | E) $f(3)$                          | F) $\lim_{x \rightarrow 3^-} f(x)$ |
| G) $\lim_{x \rightarrow 3^+} f(x)$ | H) $\lim_{x \rightarrow 3} f(x)$   | I) $\lim_{x \rightarrow -2} f(x)$  |
| J) $\lim_{x \rightarrow 0} f(x)$   | K) $\lim_{x \rightarrow -3} f(x)$  |                                    |