Pre-Calculus Honors

Name: Key :)

Day 2 Notes – Finding Limits Graphically

HAT IS A LIMIT?

A **limit** describes how the output values of a function behave as input values approaches some given number "c"

NOTATION: $\lim_{x\to c} f(x) = L$

"The limit as x approaches c of f(x) is L."

Different Kinds of Limits

$\lim_{x\to c^{\ominus}} f(x)=L$ ← Left-Hand Limit

$\lim_{x\to c^{\oplus}} f(x)=L$ ← Right-Hand Limit

$\lim_{x\to c} f(x)=L$ THE Limit

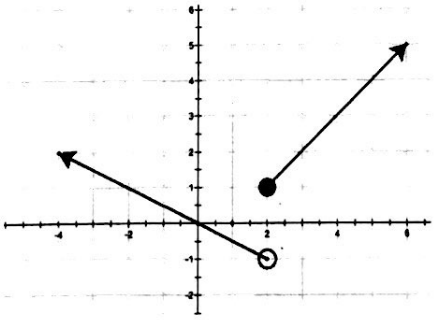
Left ≠ Right
↳ L = DNE

Examples:

$\lim_{\to 4-} f(x)=3$

$\lim_{x\to 4+} f(x)=3$

$\lim_{x\to 4} f(x)=3$



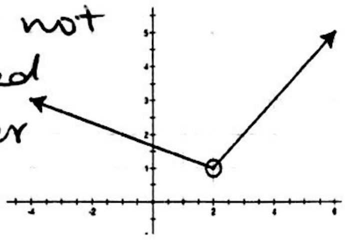
$\lim_{x\to 2-} f(x)=-1$

$\lim_{x\to 2+} f(x)=1$

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

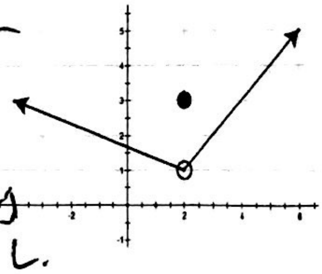
Misconception #1

A function does not have to be defined @ "c" in order for the limit to exist.



Misconception #2

If a function is defined @ "c", f(c) does not necessarily have to equal L.



Practice #1

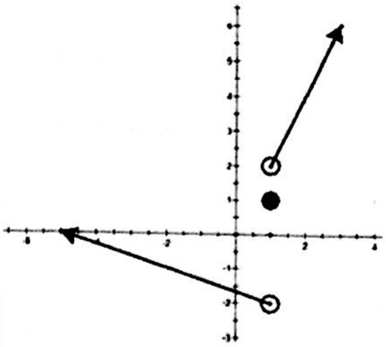
$\lim_{x\to -2} f(x) = -1$

$\lim_{x\to 1^-} f(x) = -2$

$\lim_{x\to 1^+} f(x) = 2$

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

$f(1) = 1$



Practice #2

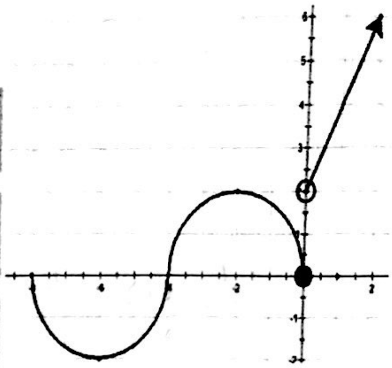
$\lim_{x\to -2} f(x) = 2$

$\lim_{x\to 0^-} f(x) = 0$

$\lim_{x\to 0^+} f(x) = 2$

$\lim_{x\to 0} f(x) = \text{DNE}$

$f(0) = 0$



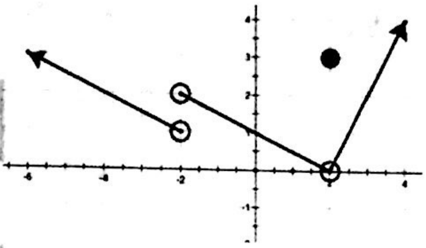
Practice #3

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

$\lim_{x\to 2^+} f(x) = 0$

$\lim_{x\to 2} f(x) = 0$

$f(2) = 3$



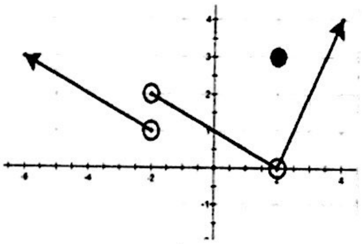
Practice #4

$\lim_{x\to -2^-} f(x) = 1$

$\lim_{x\to -2^+} f(x) = 2$

$\lim_{x\to -2} f(x) = \text{DNE}$

$f(-2) = \text{DNE}$

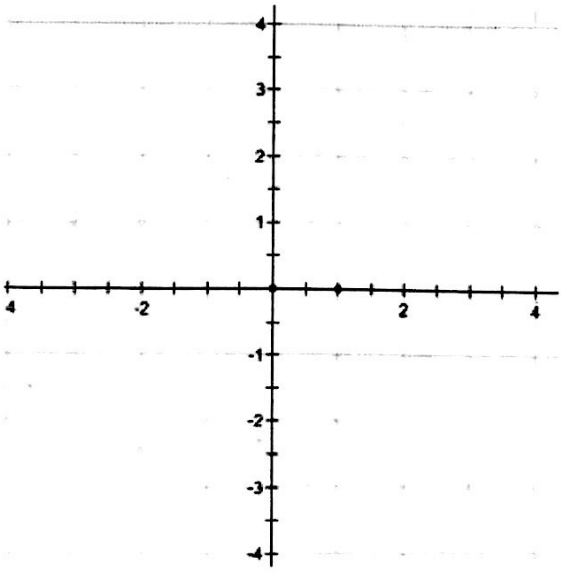


DRAW A GRAPH SUCH THAT

$\lim_{x\to 0^+} f(x) = 2$

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

$\lim_{x\to 2} f(x) = 6$



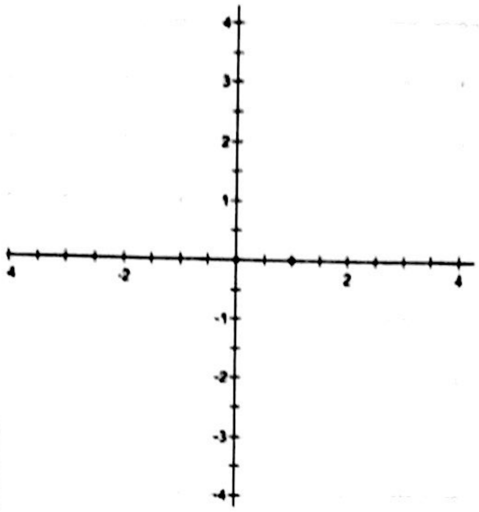
DRAW A GRAPH SUCH THAT

$\lim\limits_{x \to 3^+} f(x) = 4$

$\lim\limits_{x \to 3^-} f(x) = 2$

$\lim\limits_{x \to -1^+} f(x) = 0$

$\lim\limits_{x \to -1^-} f(x) = -2$



How to find limits in the calculator:

1. Change your TBLSET to:

   TblStart = (x-value of limit statement)

   Indpnt: ASK

2. Explore x-values in the Table which are extremely close to the x-value of the limit statement.

1. $\lim\limits_{x \to 1} \frac{x-1}{\sqrt{x}-1}$ = 2

2. $\lim\limits_{x \to -3} \frac{x}{x+3}$ = DNE

3. $\lim\limits_{x \to 0} \frac{x}{\sqrt{x+1}-1}$ =2

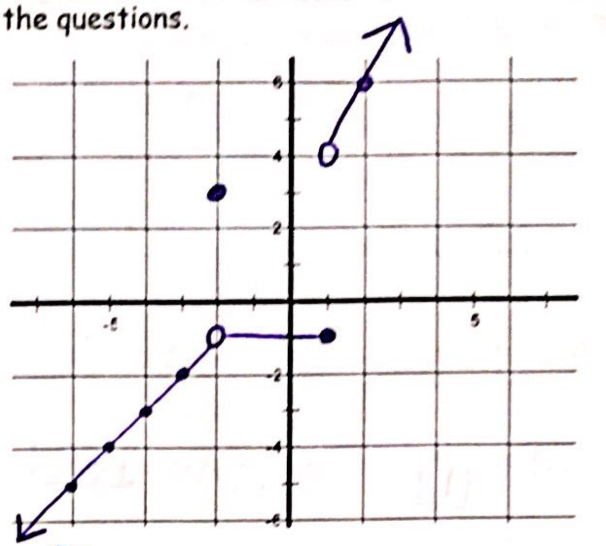
Pre-Calculus Honors

Day 2 Classwork - Finding Limits Graphically

Name: ______________________

Graph the piece-wise functions and then answer the questions.

1. $f(x)=\begin{cases} x+1 & x<-2 \\ 3 & x=-2 \\ -1 & -2<x\le 1 \\ 2x+2 & 1<x \end{cases}$



a. $\lim\limits_{x\to -2^+} =$

b. $\lim\limits_{x\to -2^-} =$

c. $\lim\limits_{x\to 1^+} =$

d. $\lim\limits_{x\to 5^+} =$

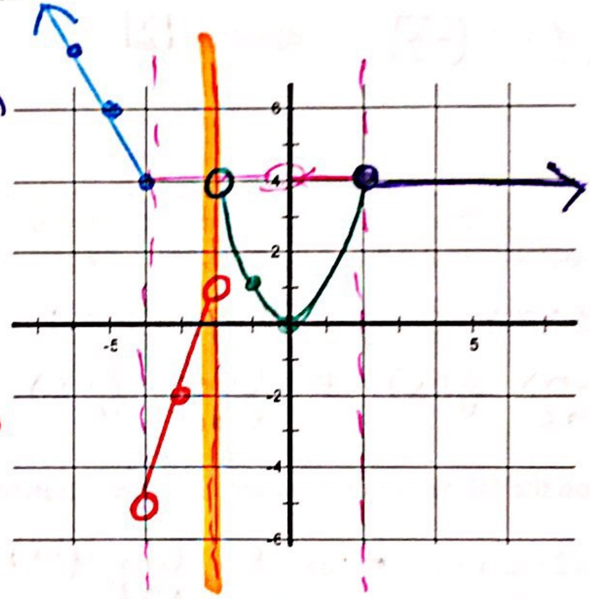
hole: < >

point: ≤ ≥

2. $f(x)=\begin{cases} -2x-4 & x\le -4 \\ 3x+7 & -4<x<-2 \\ x^2 & -2<x\le 2 \\ 4 & 2<x \end{cases}$

x	f(x)
-6	8
-5	6
-4	4
-4	-5
-3	-2
-2	1
-2	4
-1	1
0	0
2	4
2	4

y



a. $\lim\limits_{x\to -2} =$ DNE

b. $\lim\limits_{x\to 2} =$ 4

c. $\lim\limits_{x\to -4} =$ 4

d. $\lim\limits_{x\to -2^+} =$ 4

↑ Right

Find each limit with the graphing calculator.

3. $\lim\limits_{x\to 4}\dfrac{2x-8}{x^2-x-12} \approx \boxed{0.2857}$

4. $\lim\limits_{x\to 1}\dfrac{(x+1)}{(\sqrt{x}+1)} = \boxed{1}$

5. $\lim\limits_{x\to 1}\dfrac{x-1}{\ln x} = \boxed{1}$

6. $\lim\limits_{x\to -4}\sqrt{x^2-16} = \boxed{\text{DNE}}$

$\lim\limits_{x\to -4^-} f(x) = 0$

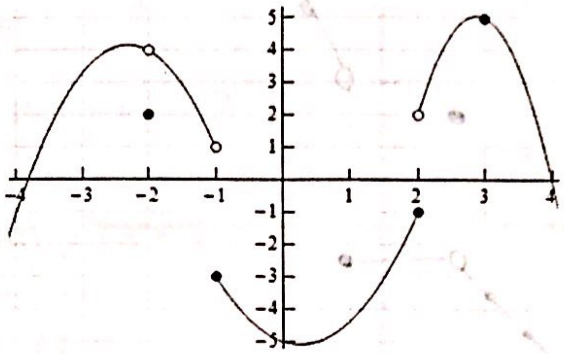
$\lim\limits_{x\to -4^+} f(x) = \text{DNE}$

Pre-Calculus Honors
Finding Limits Graphically – Day 2 Homework

Name: ______________________

DIRECTIONS: USE THE FOLLOWING GRAPHS TO ESTIMATE THE LIMITS AND FUNCTIONAL VALUES, OR EXPLAIN WHY THE LIMITS DO NOT EXIST.

1.



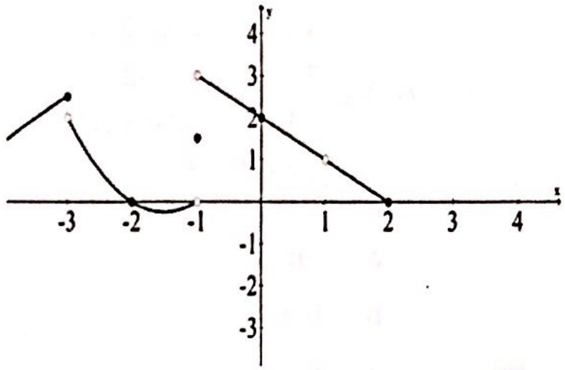
a) $\lim_{x\to -1^-} f(x) = \boxed{1}$

b) $\lim_{x\to -1^+} f(x) = \boxed{-3}$

c) $\lim_{x\to -1} f(x) = \boxed{\text{DNE}}$

d) $f(-2) = \boxed{2}$

2.



a) $\lim_{x\to -3} h(x) = \boxed{\text{DNE}}$

b) $\lim_{x\to 1} f(x) = \boxed{1}$

c) $\lim_{x\to 2} f(x) = \boxed{\text{DNE}}$

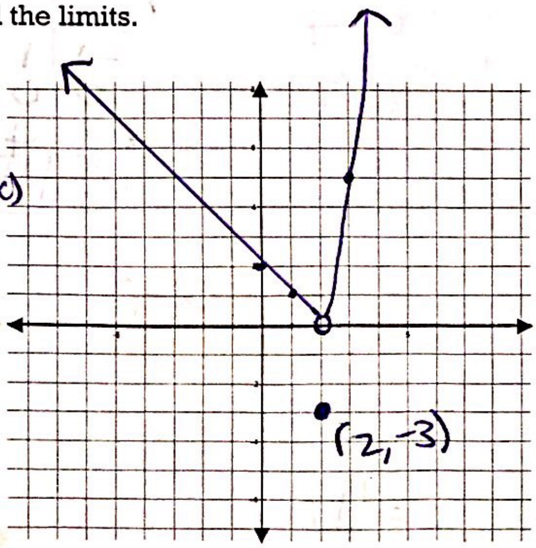
d) $f(1) = \boxed{\text{DNE}}$

3. Your friend did not do homework and was on his/her cell phone during the lesson. While looking at a graph they found that the right sided limit equaled 4 and the left sided limit equaled negative 4. They said that since 4 was a closed circle, it was the limit. Are they correct? Why or why not?

(Answers vary) The limit DNE because the $\lim_{x\to c^-} f(x) \neq \lim_{x\to c^+} f(x)$. AKA: $4 \neq -4$.

4. Graph the following piece-wise function. Then find the limits.

$$f(x)=\begin{cases}2-x;\ x<2 & \leftarrow \text{use for } \lim_{x\to 2^-} f(x)\\ -3;\ x=2 & \leftarrow f(2)\\ x^2-4;\ x>2 & \leftarrow \text{use for } \lim_{x\to 2+} f(x)\end{cases}$$



a) $\lim_{x\to 2} f(x) = \boxed{0}$

b) $\lim_{x\to -2^+} f(x) = \boxed{4}$

c) $\lim_{x\to 2^-} f(x) = \boxed{0}$

d) $f(\overset{x}{2}) = \overset{y}{\boxed{-3}}$