JANUARY 21

What is the difference between finding the limit graphically and numerically?

What are the similarities?

JANUARY 21

Students will verbally explain how to sketch a graph given limits

(using the words:

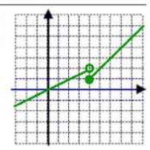
right, left, closer...)

Name: ____________________________________

Directions: Use the graphs on the right to find each limit.

1.

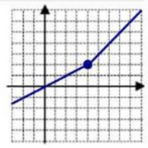
$f(x) = \begin{cases} \frac{1}{2}x & x < 4 \\ x - 3 & x \geq 4 \end{cases}$



$\lim_{x \to 4^-} f(x) =$ 2 $\lim_{x \to 4^+} f(x) =$ 1 $f(4) =$ 1

2.

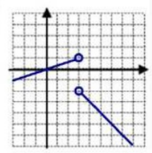
$f(x) = \begin{cases} \frac{1}{2}x & x < 4 \\ x - 2 & x \geq 4 \end{cases}$



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

3.

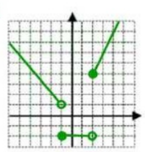
$f(x) = \begin{cases} \frac{1}{3}x & x < 3 \\ 1 - x & x > 3 \end{cases}$



$\lim_{x \to 3^-} f(x) =$ 1 $\lim_{x \to 3^+} f(x) =$ -2 $f(3) =$ undef.

4.

$f(x) = \begin{cases} -x & x < -1 \\ -2 & -1 \leq x < 2 \\ 2x & x \geq 2 \end{cases}$

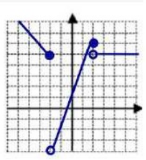


$\lim_{x \to -1^-} f(x) =$ 1 $\lim_{x \to -1^+} f(x) =$ -2 $f(-1) =$ -2

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

5.

$f(x) = \begin{cases} 3 - x & x \leq -2 \\ 2x & -2 < x \leq 3 \\ 5 & x > 3 \end{cases}$



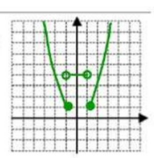
$\lim_{x \to -2^-} f(x) =$ 5 $\lim_{x \to -2^+} f(x) =$ -4 $f(-2) =$ 5

$\lim_{x \to 2^-} f(x) =$ 6 $\lim_{x \to 2^+} f(x) =$ 5 $f(2) =$ 6

f(3)=5

6.

$f(x) = \begin{cases} x^2 & x \leq -1 \\ 4 & -1 < x < 1 \\ x^2 & x \geq 1 \end{cases}$

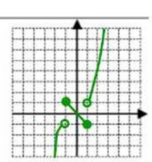


$\lim_{x \to -1^-} f(x) =$ 1 $\lim_{x \to -1^+} f(x) =$ 4 $f(-1) =$ 1

$\lim_{x \to 1^-} f(x) =$ 4 $\lim_{x \to 1^+} f(x) =$ 1 $f(1) =$ 1

7.

$f(x) = \begin{cases} -x^2 & x < -1 \\ -x & -1 \leq x \leq 1 \\ x^2 & x > 1 \end{cases}$

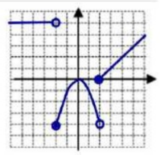


$\lim_{x \to -1^-} f(x) =$ -1 $\lim_{x \to -1^+} f(x) =$ 1 $f(-1) =$ 1

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

8.

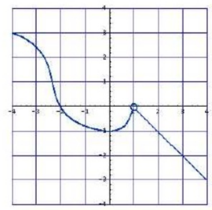
$$f(x)=\begin{cases} 5 & x<-2 \\ -x^2 & -2\le x<2 \\ x-2 & x\ge 2 \end{cases}$$



$\lim_{x\to -2^-} f(x) = 5$ $\lim_{x\to -2^+} f(x) = -4$ $f(-2) = -4$

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

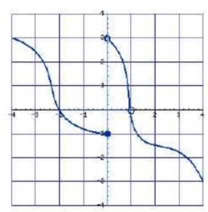
9.



$\lim_{x\to -3^-} f(x) = 2.5$ $\lim_{x\to -3^+} f(x) = 2.5$ $f(-3) = 2.5$

$\lim_{x\to 1^-} f(x) = 0$ $\lim_{x\to 1^+} f(x) = 0$ $f(1) =$ undef

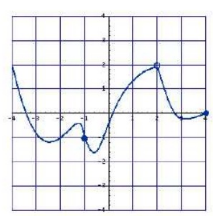
9.



$\lim_{x\to 0^-} f(x) = -1$ $\lim_{x\to 0^+} f(x) = 3$ $f(0) = -1$

$\lim_{x\to 1^-} f(x) = 0$ $\lim_{x\to 1^+} f(x) = 0$ $f(1) =$ undef

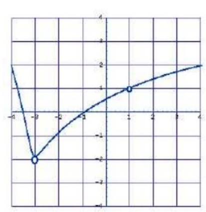
10.



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

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

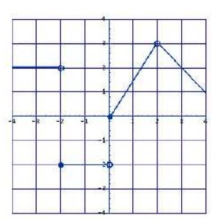
11.



$\lim_{x\to -3} f(x) = -2$ $\lim_{x\to -1} f(x) = 0$

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

12.



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

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

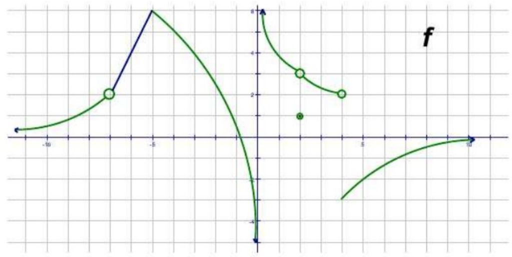
$\lim_{x\to 2^-} f(x) = 3$ $\lim_{x\to 2^+} f(x) = 3$ $\lim_{x\to 2} f(x) = 3$

f(2) = DNE

Limits and Continuous Functions

Name:______________________________
Period:____________Date:_______________

I. The graph of a function f is shown below.



Answer the following questions about function f.

1. $f(-5) =$ 6
2. $\boxed{f(2) = 1}$
3. $f(4) =$ undefined
4. $\lim_{x \to -7} f(x) =$ 2
5. $\lim_{x \to -5} f(x) =$ 6
6. $\boxed{\lim_{x \to 2} f(x) = 3}$
7. $\lim_{x \to 4} f(x) =$ DNE
8. $\lim_{x \to 0} f(x) =$ DNE
9. $\lim_{x \to 0^-} f(x) = -\infty$
10. $\lim_{x \to 0^+} f(x) = \infty$
11. $\lim_{x \to 4^+} f(x) = -3$
12. $\lim_{x \to 4^-} f(x) = 2$
13. $\lim_{x \to -\infty} f(x) = 0$
14. $\lim_{x \to \infty} f(x) = 0$

$\lim_{x \to -7} f(x) = 2 \neq f(-7)$

15.

a. f is not continuous at x = -7 because: f(-7) is undefined - REMOVABLE

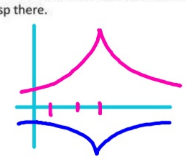
b. f is not continuous at x = 2 because: $f(2) \neq$ limit as x approaches 2 - REMOVABLE

c. f is not continuous at x = 4 because: limit from the left does not equal the limit from the right - JUMP

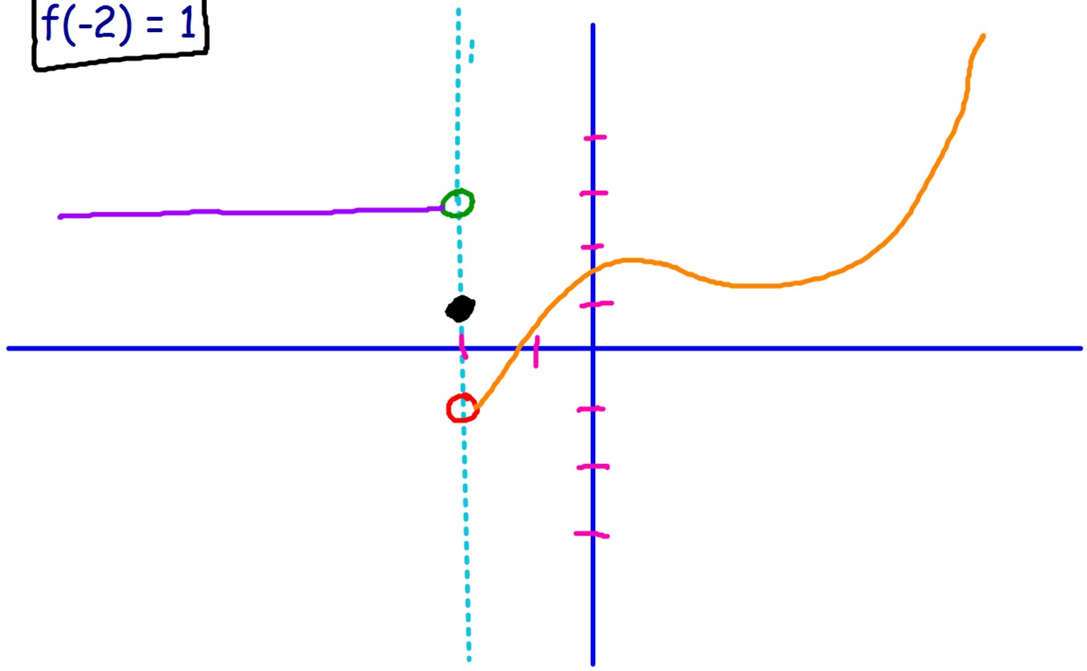
$\lim_{x \to 2} f'(x) = 3 \neq f(2) = 1$

$\lim_{x \to 4^-} f(x) \neq \lim_{x \to 4^+} f(x)$

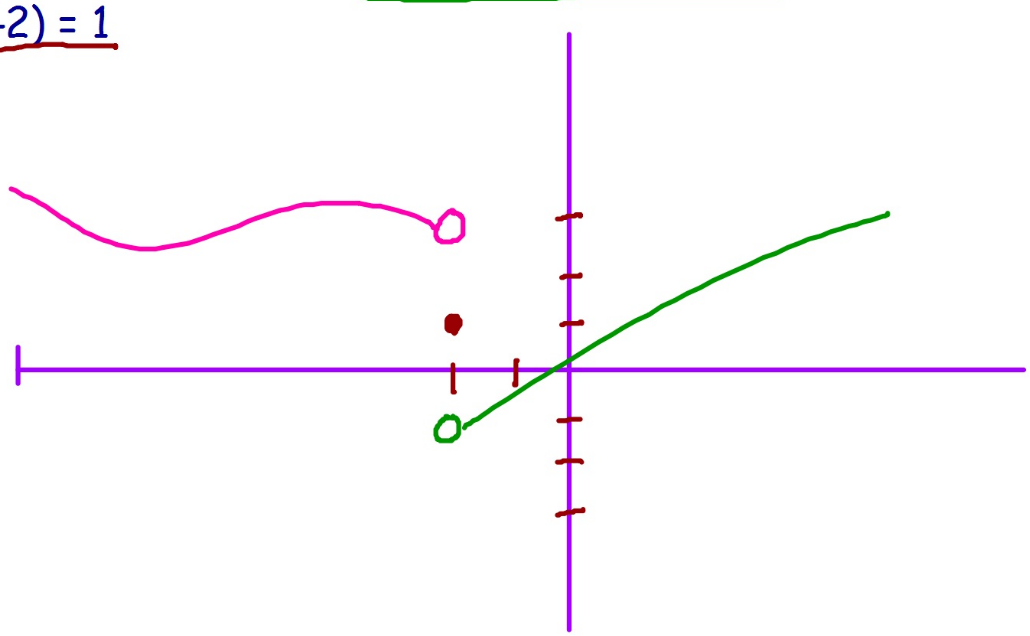
II. For the following problems, sketch a graph of a function that has the indicated features and write an equation for the function that has these features. The function may be a piecewise.

1. The function is continuous at x = 3, but has a cusp there. 	2. The function has a limit as x approaches 3 but fails to be continuous there because f(3) is undefined.
3. The function has a limit as x approaches -1, has a value for f(-1), but still is not continuous there.	4. The function has no limit as x approaches 0, but f(0)=3.
5. The function has a limit of 2 as x approaches 0 from the right, but has no limit as x approaches 0 from the left.	6. The function has a step (or jump) discontinuity at x = 1, and f(1) = 6.
7. The function has a limit as x approaches 2 of 5 but f(2) = 4.	8. The function has a right-hand limit of -2 and a left-hand limit of 2 as x approaches -1.

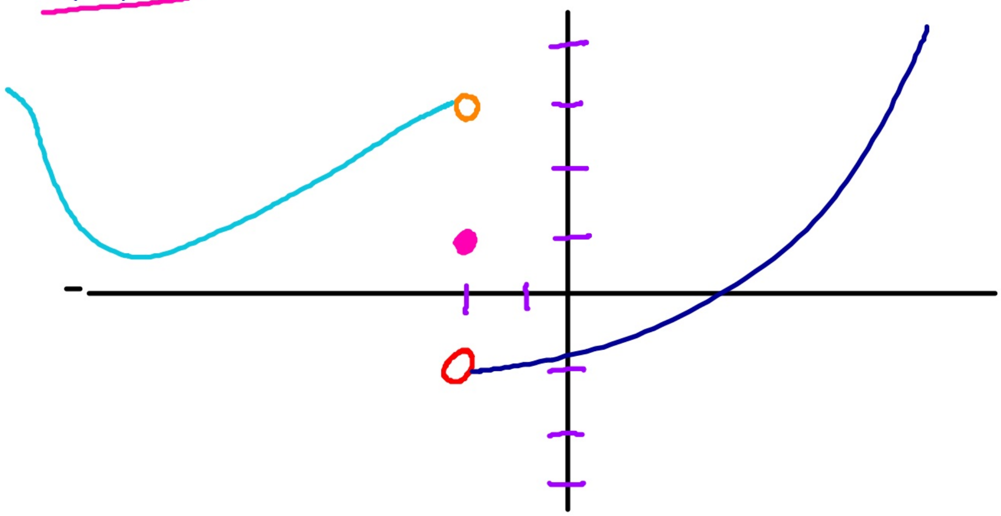
Sketch a function that has
a left-hand limit of 3 as x approaches -2 and
a right-hand limit of -1 as x approaches -2, but
$\boxed{f(-2) = 1}$



Sketch a function that has
a left-hand limit of 3 as x approaches -2 and
a right-hand limit of -1 as x approaches -2, but
f(-2) = 1



Sketch a function that has
a left-hand limit of 3 as x approaches -2 and
a right-hand limit of -1 as x approaches -2, but
f(-2) = 1



★ The function has a limit as x approaches -1 of 4 but f(-1) = 2

★

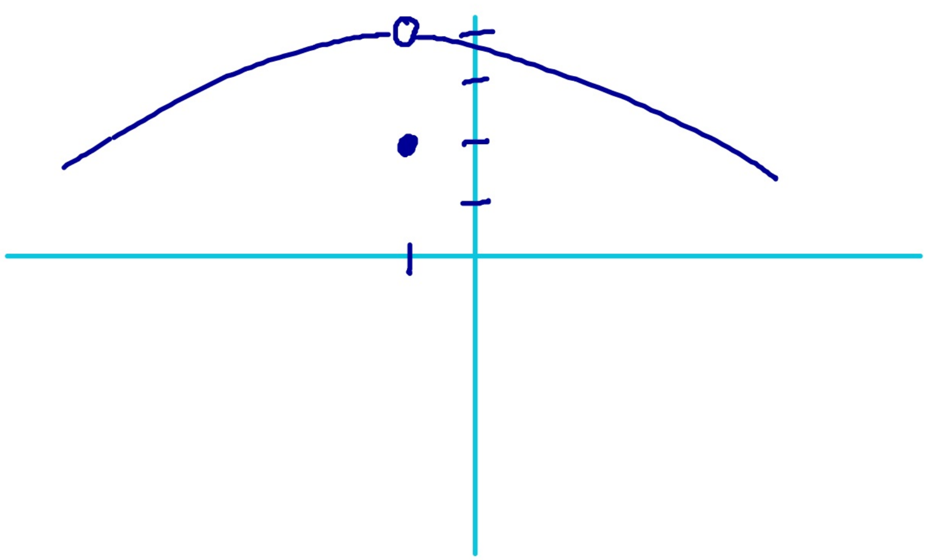
★

★

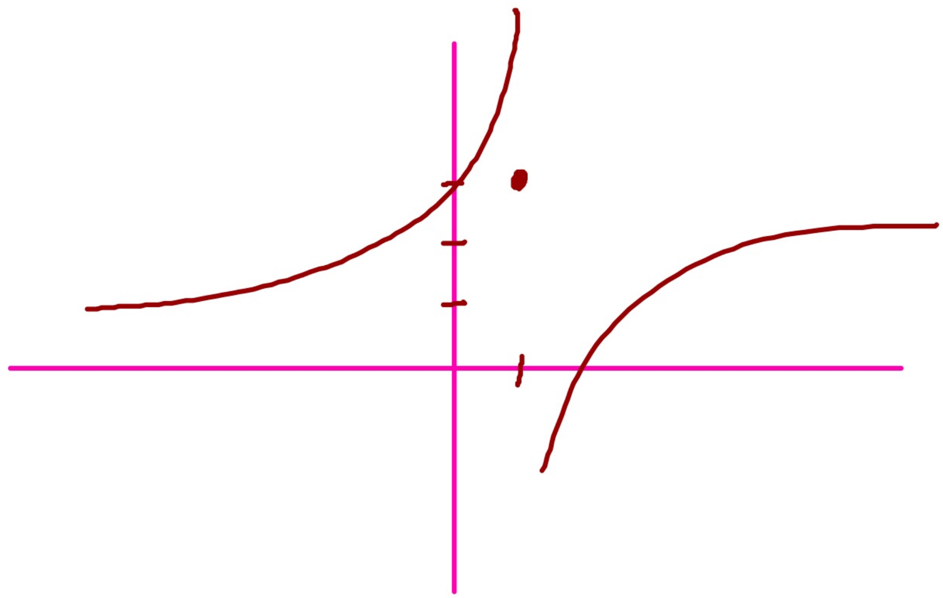
★

★

★



The function has no limit as x approaches 1, but f(1)=3



Assignment #1
pg 88 #51-54, 57-59, 63, 65

Assignment #2
pg 74 #1-6, 17-27 (odd), 49-53