Day 6

Tuesday, September 19, 2017
8:31 PM

Copy Guided Notes

Unit 2 Day 7 (12.1) guid...

I. Warm-up/ Homework Questions
II. Notes on limits o f rational functions
III. Assignments

5-Minute Check (over Lesson 2-5)

3. Solve $x + \frac{8}{x} = 6$.

$x^2 + 8 = 6x$
$x^2 - 6x + 8 = 0$
$(x-4)(x-2) = 0$
$\boxed{x = 4 \quad x = 2}$

Standardized Test Practice

4. Solve $\frac{3}{x-2} + \frac{2}{x+4} = \frac{23}{x^2 + 2x - 8}$.

$(x+4)(x-2)$

A 2, −4 **C** 3

B 2 **D** no solution

$3x + 12 + 2x - 4 = 23$
$5x + 8 = 23$
$5x = 15$
$x = 3$

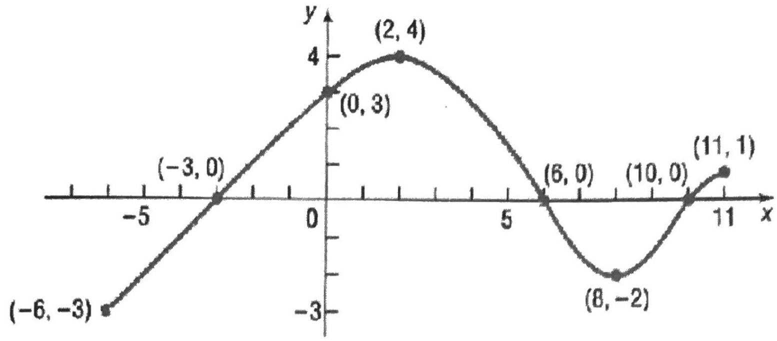
3. 2, 4

4. C

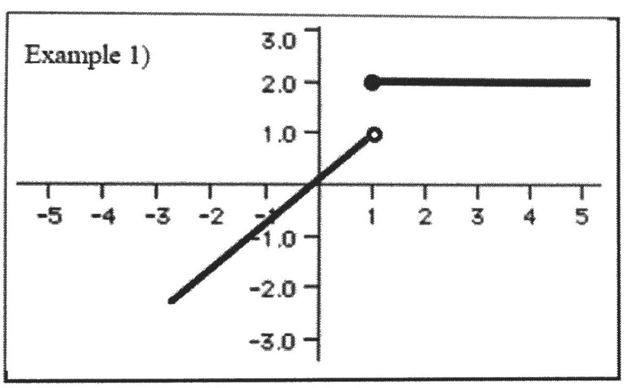
Homework Questions

Today's Objectives:

- Estimate limits of function at a point.
- Estimate limits of functions at infinity.



The informal of definition of a limit is "what is happening to y as x gets close to a certain number." In order for a limit to exist, we must be approaching the same y-value as we approach some value c from either the left or the right side. If this does not happen, we say that the limit does not exist (DNE) as we approach c.

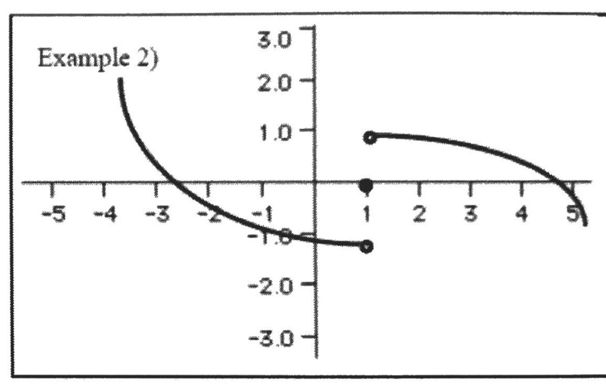


$\lim_{x\to1^-} f(x) = 1$ $\lim_{x\to1^+} f(x) = 2$ from the right

from the left

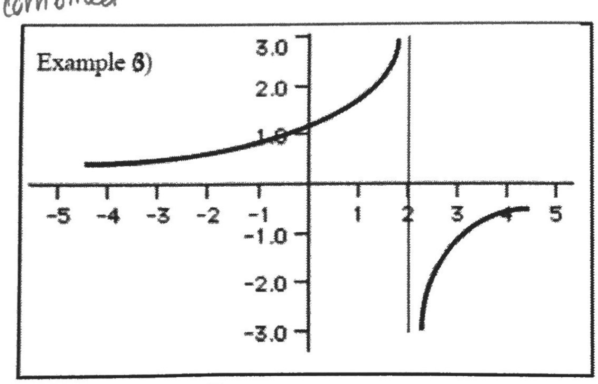
$\lim_{x\to1} f(x) =$ DNE $f(1) = 2$

combined



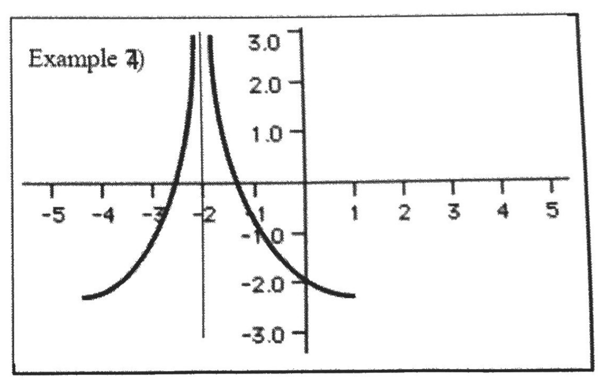
$\lim_{x\to1^-} f(x) = -1$ $\lim_{x\to1^+} f(x) = 1$

$\lim_{x\to1} f(x) =$ DNE $f(1) = 0$



$\lim_{x\to2^-} f(x) = \infty$ $\lim_{x\to2^+} f(x) = -\infty$

$\lim_{x\to2} f(x) =$ DNE $f(2) =$ DNE



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

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

KeyConcept Independence of Limit from Function Value at a Point

Words The limit of a function $f(x)$ as x approaches c *does not* depend on the value of the function *at* point c.

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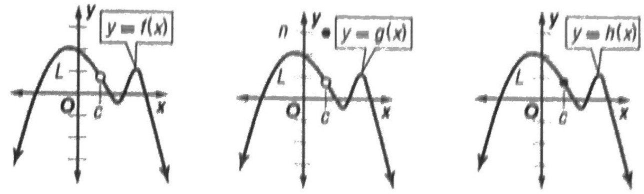
Symbols



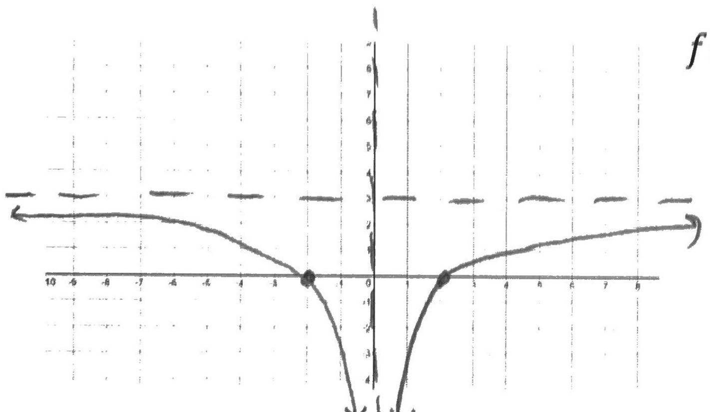
$\lim_{x \to c} f(x) = L$	$\lim_{x \to c} g(x) = L$	$\lim_{x \to c} h(x) = L$
$f(c)$ is undefined.	$g(c) = n$	$h(c) = L$

Let's apply this to rational functions

Sketch a graph and write a limit to describe the end behavior of the given function.

$$f(x) = \frac{3x^2 - 12}{x^2}$$

$\frac{3(x-2)(x+2)}{x^2}$



VA: $x = 0$
HA: $y = 3$
intercepts: $x = 2,\ x = -2$

Evaluate: $\lim_{x \to 3} f(x) = \frac{15}{9}$ $\qquad \lim_{x \to 0} f(x) = -\infty$

$\frac{3(3-2)(3+2)}{3^2} = \frac{3(1)(5)}{9}$

What causes a function to have a hole?
a factor that cancels in the numerator & denominator

Is there a mathematical way to remove the hole?
use a piecewise function and define the point

Graph $f(x) = \frac{2x^2-x-6}{x-2}$ and use the graph to estimate each limit

$$\lim_{x \to 2} \frac{2x^2 - x - 6}{x - 2}$$

	x	-2
$2x$	$2x^2$	$-4x$
3	$3x$	-6

-12
$\wedge$
$-4+3=-1$

$\frac{(2x+3)\cancel{(x-2)}}{\cancel{x-2}}$

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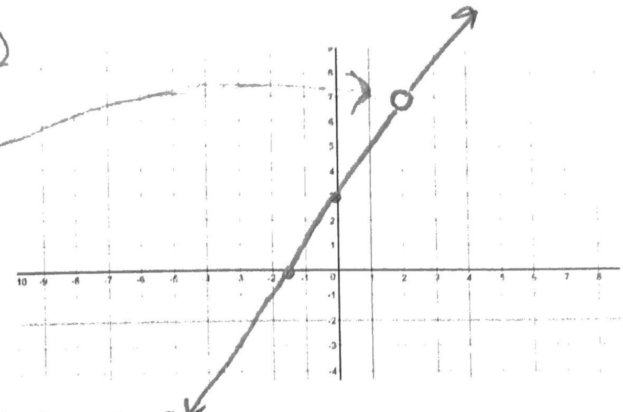
$2(2)+3=7$



$$\lim_{x\to 2}\frac{2x^2-x-6}{x-2}=7$$

$$\lim_{x\to \infty}\frac{2x^2-x-6}{x-2}=\infty$$

VA: none

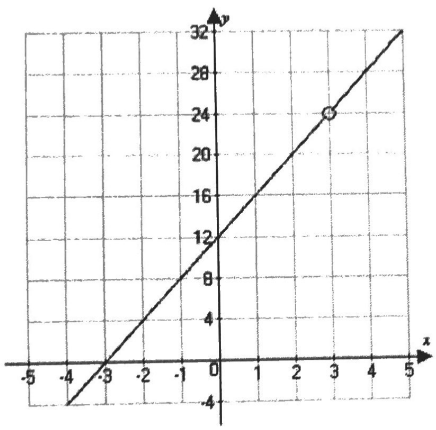
HA: none

holes: $x=2$

Intercepts: $x=-\frac{3}{2}$, $y=3$

Use the graph to find

$$\lim_{x\to 3}\frac{4x^2-36}{x-3}=24$$



Verify the solution algebraically.

x	2.9	2.99	3	3.01	3.1
Y	23.6	23.96	error	24.04	24.4

approaching 24 from both sides

For most limits, you can evaluate the function at the given point. If the point is undefined, you will need to decide if the point is a hole or asymptote before determining the limit.

Evaluate each limit algebraically.

$$\lim_{x\to -2}\frac{2x-6}{x-2}=2.5$$

$$\lim_{x\to 2}\frac{2x+5}{x-2}=\text{DNE}$$

$$\lim_{x\to 2^-}\frac{2x+5}{x-2}=-\infty$$

$$\lim_{x\to 2^+}\frac{2x+5}{x-2}=\infty$$

$$\lim_{x\to \infty}\frac{4x^2+50}{x^3-85}=0$$

$$\lim_{x\to \infty}\frac{2x-3}{4x+5}=\frac{1}{2}$$

$$\lim_{x\to 4}\frac{x^2-16}{x-4}=8$$

$$\lim_{x\to -1}\frac{x^2+6x+5}{x^2-3x-4}=-0.8$$