DO NOW

Look over the notes from yesterday to refresh your memory on where we left off.

View video clip 🌐

2.2 Finding Limits Graphically/Numerically - Day 2
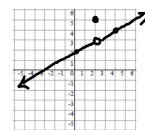
What if...

$$f(x) = \begin{cases} \dfrac{x^2 + 2x - 8}{2(x-2)} & x \neq 2 \\ 5 & x = 2 \end{cases}$$

does the $\lim\limits_{x \to 2}$ change?

NO.
f(x) still approaches 3 as x approaches 2.
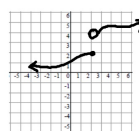
★ Limit exists and is different than f(x).

Limits that fail to exist:
  Given: function f(x):

1. f(x) approaches a different number from the right side of c than it approaches from the left side of c.

2. f(x) increases or decreases without bound as x→c.
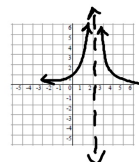
3. f(x) oscillates between two values as x→c.

Examples of Limits that don't exist:

$$\lim_{x \to 2^-} f(x) = 2$$
$$\lim_{x \to 2^+} f(x) = 4$$
∴ $\lim\limits_{x \to 2} f(x) = D.N.E.$

★ f(c) defined
$\lim\limits_{x \to c} f(c)$ DNE

★ lim from left ≠ lim from right

$\lim\limits_{x \to 2} f(x) = DNE$

★ unbounded behavior

$f(x) = \sin\dfrac{1}{x}$
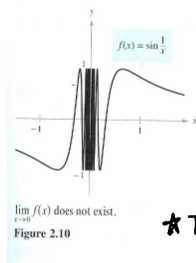
x	$2/\pi$	$2/3\pi$	$2/5\pi$	$2/7\pi$	$2/9\pi$	$2/11\pi$	$x \to 0$
sin(1/x)	1	−1	1	−1	1	−1	Limit does not exist.

$\lim\limits_{x \to 0} f(x)$ does not exist.
Figure 2.10

$\lim\limits_{x \to 0} \sin\dfrac{1}{x} = DNE$

★ The oscillation increases as x→0

Classwork 2.2 Worksheet

Ⓐ Given the functions defined by the graphs in Figure 2.19, find the limits in Problems 1–6.
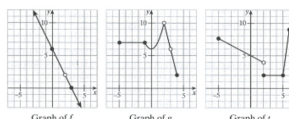
Graph of f   Graph of g   Graph of t
■ FIGURE 2.19 Graphs of the functions f, g, and t

1. a. $\lim\limits_{x \to 3} f(x)$ b. $\lim\limits_{x \to 0} f(x)$ c. $\lim\limits_{x \to 1} f(x)$
2. a. $\lim\limits_{x \to -3} g(x)$ b. $\lim\limits_{x \to 0} g(x)$ c. $\lim\limits_{x \to 3} g(x)$
3. a. $\lim\limits_{x \to 4} t(x)$ b. $\lim\limits_{x \to -4} t(x)$ c. $\lim\limits_{x \to -5} t(x)$
4. a. $\lim\limits_{x \to -3} f(x)$ b. $\lim\limits_{x \to 2} f(x)$ c. $\lim\limits_{x \to 2} f(x)$
5. a. $\lim\limits_{x \to -3} g(x)$ b. $\lim\limits_{x \to 3} g(x)$ c. $\lim\limits_{x \to 4} g(x)$
6. a. $\lim\limits_{x \to 1} t(x)$ b. $\lim\limits_{x \to 1} t(x)$ c. $\lim\limits_{x \to 2} t(x)$

1a. 0   b. 2
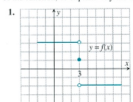 c. 6
2a. 7   b. 7
  c. DNE
3. a 2 b.7 c. 8
4. a. 2 b. 2 c. 2
5. a. 6 b. 6 c. 6
6a. 4 b 2 c. DNE
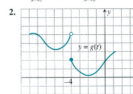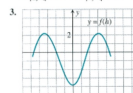
In Exercises 1–6, use the graph to estimate the limits and value of the function, or explain why the limits do not exist.

1.

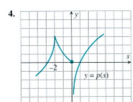$y = f(x)$

a. 3
b. -2
C. DNE
d. 1

(a) $\lim_{x \to 3^-} f(x)$ (b) $\lim_{x \to 3^+} f(x)$ (c) $\lim_{x \to 3} f(x)$ (d) $f(3)$

2.

$y = g(t)$

a. 2
b. 5
C. DNE
d. 2

(a) $\lim_{t \to -4^-} g(t)$ (b) $\lim_{t \to -4^+} g(t)$ (c) $\lim_{t \to -4} g(t)$ (d) $g(-4)$

3.

$y = f(h)$

a. -4
b. -4
C. -4
d. -4

(a) $\lim_{h \to 0^-} f(h)$ (b) $\lim_{h \to 0^+} f(h)$ (c) $\lim_{h \to 0} f(h)$ (d) $f(0)$

4.

$y = p(s)$

a. 3
b. 3
C. 3
d. 3

(a) $\lim_{s \to -2^-} p(s)$ (b) $\lim_{s \to -2^+} p(s)$ (c) $\lim_{s \to -2} p(s)$ (d) $p(-2)$

5.

$y = F(x)$

a. 4
b. -3
C. DNE
d. 4
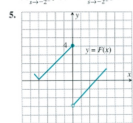
(a) $\lim_{x \to 0^-} F(x)$ (b) $\lim_{x \to 0^+} F(x)$ (c) $\lim_{x \to 0} F(x)$ (d) $F(0)$

6.

$y = G(x)$

a. 1
b. 1
C. 1
d. 3

(a) $\lim_{x \to 2^-} G(x)$ (b) $\lim_{x \to 2^+} G(x)$ (c) $\lim_{x \to 2} G(x)$ (d) $G(2)$

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HOMEWORK

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