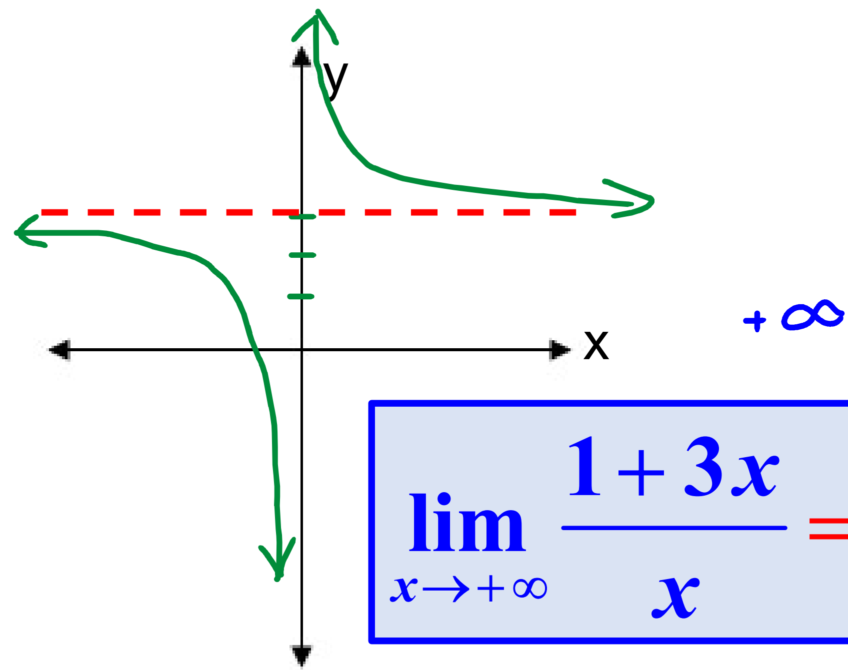
Notes: 13.1 Limits (graphical approach)

EXAMPLE 1:

sketch a graph of

$$y = \frac{1+3x}{x}$$



$$\lim_{x \to +\infty} \frac{1+3x}{x} = 3$$

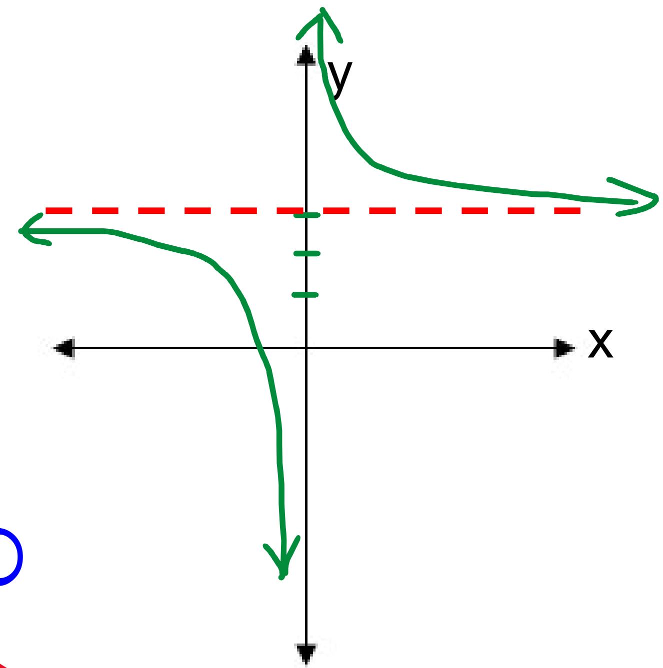
As x "approaches" ∞ (infinity), the graph gets close to zero. as $x \to^{+}\infty$, y = 3

Notes 13.1

EXAMPLE 1 (continued)

a. $\lim_{x\to-\infty} \frac{1+3x}{x} = 3$

As x approaches negative infinity



b. $\lim_{x\to 0^+} \frac{1+3x}{x} = +\infty$

As x approaches zero from the right

dne (does not exist)

c. $\lim_{x\to 0^-} \frac{1+3x}{x} = -\infty$

As x approaches zero from the left

EXAMPLE 2

$$f(x) = \begin{cases} -x+3 & \text{if } x < -1 \\ 3 & \text{if } x \geq -1 \end{cases}$$

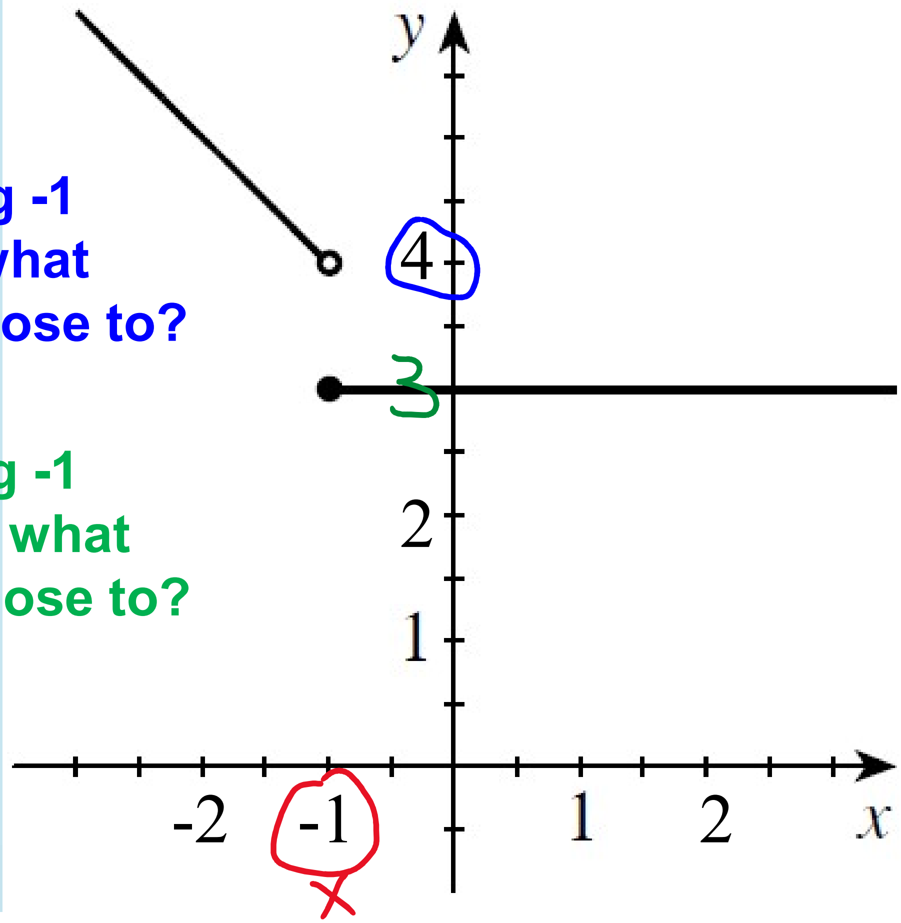
(a) $\lim_{x \to -1^-} f(x)$ **= 4**

As x is approaching -1 from the left side, what value is y getting close to?

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

As x is approaching -1 from the right side, what value is y getting close to?

(c) $\lim_{x \to -1} f(x)$ **= dne**



The limit does not exist unless the graph approaches the SAME value from the left side AND right side.

Notes: 13.2 Limits (algebraic approach)

1. Factor, if possible.
2. Cancel like terms, simplify.
3. Substitute numerical value and solve.

EXAMPLE: evaluate the limit, if it exists.

$$\lim_{x \to 3} \frac{x-3}{x^2-9}$$

13.2 EXAMPLE: evaluate the limit, if it exists.

$$\lim_{x\to 3}\frac{x-3}{x^2-9} = \frac{x-3}{(x+3)(x-3)}$$

$$= \frac{1}{x+3}$$

$$= \frac{1}{3+3} = \boxed{\frac{1}{6}}$$

Therefore, the graph is approaching 1/6 at x = 3

1. Factor, if possible.
2. Cancel like terms, simplify.
3. Substitute numerical value and solve.

Write problem and answer using proper notation (no sketch needed…use Desmos for #29,30)

17–20 Limits from a Graph For the function f whose graph is given, state the value of the given quantity if it exists.

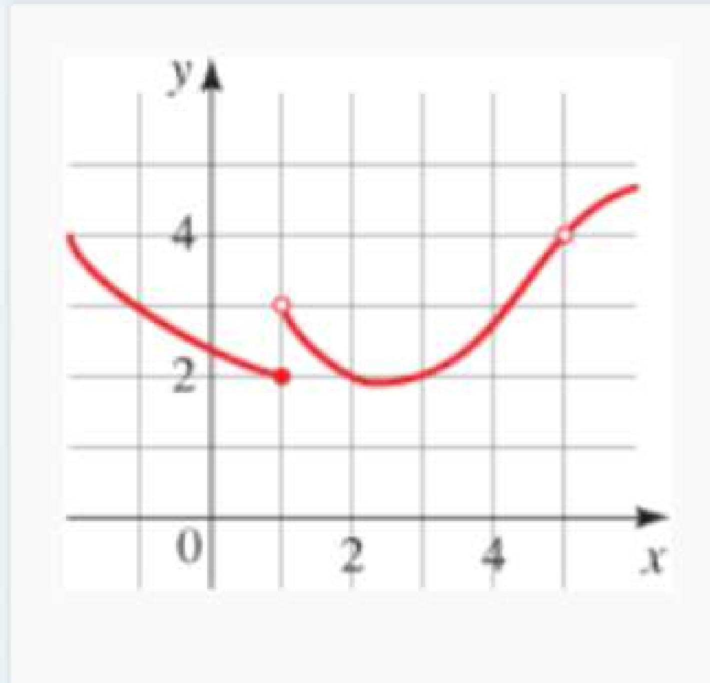
17.(a) $\lim_{x \to 1^-} f(x) = 2$

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

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

(d) $\lim_{x \to 5} f(x) = 4$

(e) $f(5) =$ undefined



Tip: scroll down to see graph in ebook.