

## 1.4 Continuity and One-Sided Limits

- Determine continuity at a point and continuity on an open interval.
- Determine one-sided limits and continuity on a closed interval.
- Use properties of continuity.
- Understand and use the Intermediate Value Theorem.

### One-sided Limits

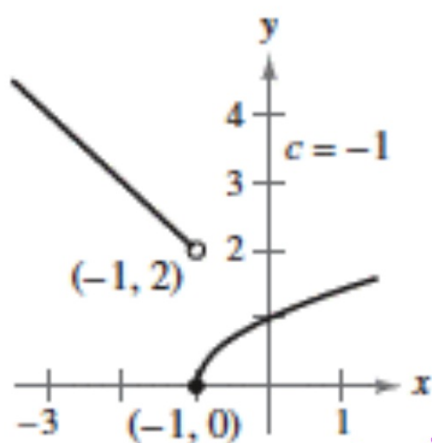
Evaluate.

(a)  $\lim_{x \rightarrow c^+} f(x)$

(b)  $\lim_{x \rightarrow c^-} f(x)$

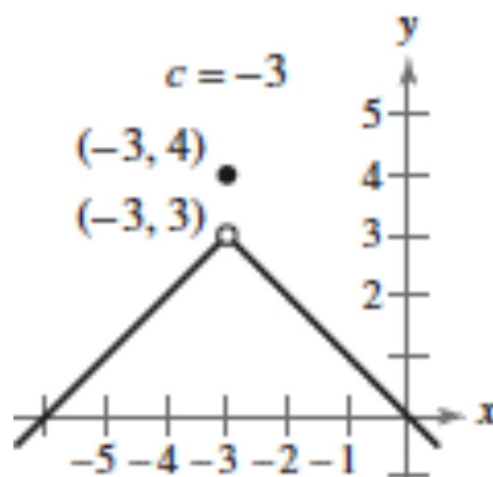
(c)  $\lim_{x \rightarrow c} f(x)$

Ex 1



a.) 0 b.) 2 c.) dne

Ex 2



a.) 3 b.) 3 c.) 3

### Ex 3

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

$$\lim_{x \rightarrow -3^+} \frac{\cancel{x-3}}{(\cancel{x-3})(x+3)}$$

$$\lim_{x \rightarrow -3^+} \frac{1}{x+3}$$

$\infty$

$$\frac{1}{-2.99+3} = \frac{1}{.01} = 100$$

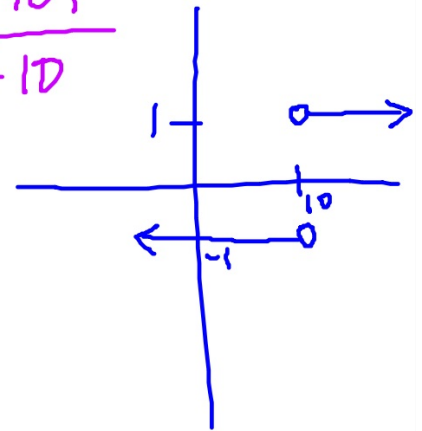


### Ex 4

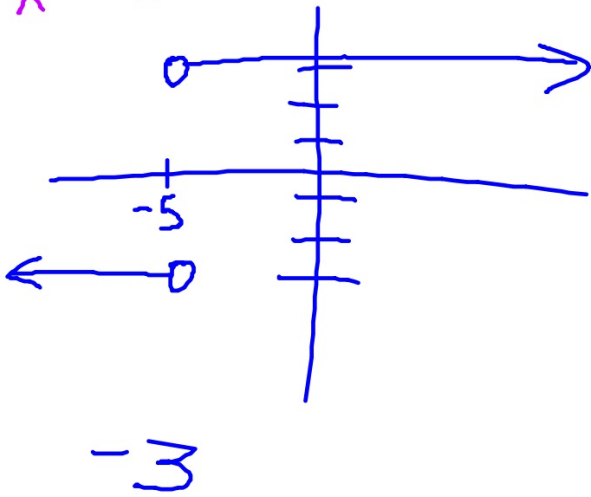
$$\lim_{x \rightarrow 10^+} \frac{|x-10|}{x-10}$$

$$\frac{|10.1-10|}{10.1-10}$$

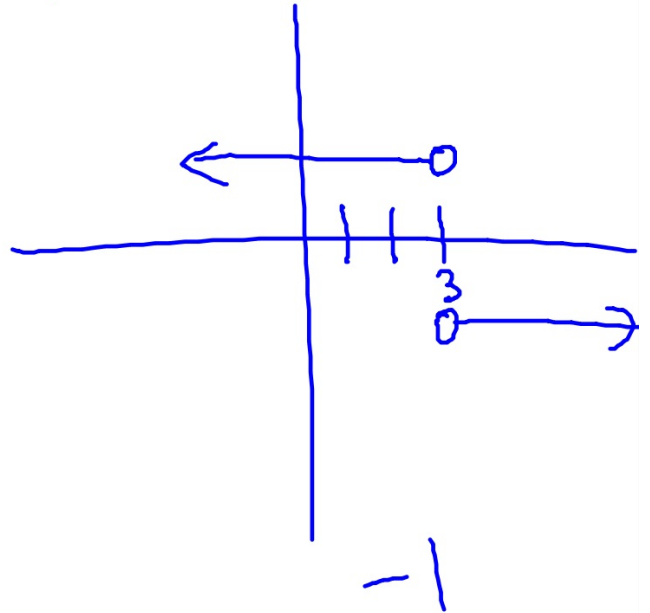
$$\frac{.1}{.1}$$



$$\lim_{x \rightarrow -5^-} \frac{3|x+5|}{x+5}$$



$$\lim_{x \rightarrow 3^+} \frac{|3-x|}{3-x}$$



### Ex 5

$$\lim_{x \rightarrow 2} f(x), \text{ where } f(x) = \begin{cases} x^2 - 4x + 6, & x < 2 \\ -x^2 + 4x - 2, & x \geq 2 \end{cases}$$

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

### Ex 6

$$\lim_{x \rightarrow 2^+} (2x - [x])$$

### Ex 6

$$\lim_{x \rightarrow 2^+} (2x - [x]) = \lim_{x \rightarrow 2^+} 2x - \lim_{x \rightarrow 2^+} [x]$$

p. 78

1-6 All

17-23 odd  
13

$$= 4 - 2$$

$$= 2$$

