

Math Sheet

Name _____ Score _____ Teacher _____ Date _____

Limits at Jump Discontinuities

Find the left-hand, right-hand and two-sided limit at each junction.

1. $f(x) =$
 $-4, x < 0$
 $-2, x > 0$

$\lim_{x \rightarrow 0^-} f(x) =$ _____

$\lim_{x \rightarrow 0^+} f(x) =$ _____

$\lim_{x \rightarrow 0} f(x) =$ _____

2. $f(x) = -1 + 2 \frac{|x+1|}{x+1}$

$\lim_{x \rightarrow -1^-} f(x) =$ _____

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

$\lim_{x \rightarrow -1} f(x) =$ _____

3. $f(x) =$
 $x - \frac{5}{2}, x < 1$
 $x - \frac{1}{2}, x > 1$
 $f(1) = -3/2$

$\lim_{x \rightarrow 1^-} f(x) =$ _____

$\lim_{x \rightarrow 1^+} f(x) =$ _____

$\lim_{x \rightarrow 1} f(x) =$ _____

4. $f(x) = 2 + 2 \frac{|x-1|}{x-1}$

$\lim_{x \rightarrow 1^-} f(x) =$ _____

$\lim_{x \rightarrow 1^+} f(x) =$ _____

$\lim_{x \rightarrow 1} f(x) =$ _____

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Find the left-hand, right-hand and two-sided limit at each junction.

5. $f(x) =$

$$\frac{1}{2} \cdot x^2 + 2 \cdot x + \frac{3}{2}, x < -1$$
$$\frac{1}{2} \cdot x^2 + 2 \cdot x + \frac{1}{2}, x > -1$$
$$f(-1) = -1$$

$\lim_{x \rightarrow -1^-} f(x) =$ _____

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

$\lim_{x \rightarrow -1} f(x) =$ _____

6. $f(x) = -2 - 2 \frac{|x - 1|}{x - 1}$

$\lim_{x \rightarrow 1^-} f(x) =$ _____

$\lim_{x \rightarrow 1^+} f(x) =$ _____

$\lim_{x \rightarrow 1} f(x) =$ _____

7. $f(x) =$

$$2, x < 1$$
$$0, x > 1$$
$$f(1) = 4$$

$\lim_{x \rightarrow 1^-} f(x) =$ _____

$\lim_{x \rightarrow 1^+} f(x) =$ _____

$\lim_{x \rightarrow 1} f(x) =$ _____

8. $f(x) = 2 \frac{|x - 2|}{x - 2}$

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

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

$\lim_{x \rightarrow 2} f(x) =$ _____

Limits at Jump Discontinuities

Worked Answer Key

Find the left-hand, right-hand and two-sided limit at each junction.

1. $f(x) =$

$$\begin{aligned} & -4, x < 0 \\ & -2, x > 0 \end{aligned}$$

$$\begin{aligned} \lim_{x \rightarrow 0^-} f(x) &= -4 \\ \lim_{x \rightarrow 0^+} f(x) &= -2 \\ \lim_{x \rightarrow 0} f(x) &= \text{DNE} \end{aligned}$$

Exact substitution into the adjacent polynomial pieces gives unequal one-sided limits. Original domain: $x \neq 0$

2. $f(x) = -1 + 2 \frac{|x + 1|}{x + 1}$

$$\begin{aligned} \lim_{x \rightarrow -1^-} f(x) &= -3 \\ \lim_{x \rightarrow -1^+} f(x) &= 1 \\ \lim_{x \rightarrow -1} f(x) &= \text{DNE} \end{aligned}$$

The sign of $x+1$ changes across the junction, producing two different constants. Original domain: $x \neq -1$

Limits at Jump Discontinuities

Worked Answer Key

Find the left-hand, right-hand and two-sided limit at each junction.

3. $f(x) =$

$$x - \frac{5}{2}, x < 1$$

$$x - \frac{1}{2}, x > 1$$

$$f(1) = -3/2$$

$$\lim_{x \rightarrow 1^-} f(x) = -3/2$$

$$\lim_{x \rightarrow 1^+} f(x) = 1/2$$

$$\lim_{x \rightarrow 1} f(x) = \text{DNE}$$

Exact substitution into the adjacent polynomial pieces gives unequal one-sided limits. $f(1) = -3/2$. Original domain: All real x .

4. $f(x) = 2 + 2 \frac{|x - 1|}{x - 1}$

$$\lim_{x \rightarrow 1^-} f(x) = 0$$

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

$$\lim_{x \rightarrow 1} f(x) = \text{DNE}$$

The sign of $x - a$ changes across the junction, producing two different constants. Original domain: $x \neq 1$

Limits at Jump Discontinuities

Worked Answer Key

Find the left-hand, right-hand and two-sided limit at each junction.

5. $f(x) =$

$$\frac{1}{2} \cdot x^2 + 2 \cdot x + \frac{3}{2}, x < -1$$

$$\frac{1}{2} \cdot x^2 + 2 \cdot x + \frac{1}{2}, x > -1$$

$$f(-1) = -1$$

$$\lim_{x \rightarrow -1^-} f(x) = 0$$

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

$$\lim_{x \rightarrow -1} f(x) = \text{DNE}$$

Exact substitution into the adjacent polynomial pieces gives unequal one-sided limits. $f(-1) = -1$. Original domain: All real x .

6. $f(x) = -2 - 2 \frac{|x - 1|}{x - 1}$

$$\lim_{x \rightarrow 1^-} f(x) = 0$$

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

$$\lim_{x \rightarrow 1} f(x) = \text{DNE}$$

The sign of $x - a$ changes across the junction, producing two different constants. Original domain: $x \neq 1$

Limits at Jump Discontinuities

Worked Answer Key

Find the left-hand, right-hand and two-sided limit at each junction.

7. $f(x) =$

$$2, x < 1$$

$$0, x > 1$$

$$f(1) = 4$$

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

$$\lim_{x \rightarrow 1^+} f(x) = 0$$

$$\lim_{x \rightarrow 1} f(x) = \text{DNE}$$

Exact substitution into the adjacent polynomial pieces gives unequal one-sided limits. $f(1) = 4$. Original domain: All real x .

8. $f(x) = 2 \frac{|x - 2|}{x - 2}$

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

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

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

The sign of $x - a$ changes across the junction, producing two different constants. Original domain: $x \neq 2$