

Objective 3 - Evaluating Limits

Interpret the notation for limits.

[Link to section in online textbook.](#)

[Video for evaluating a limit.](#)

Now that we have learned about left- and right-hand limits, we can evaluate the limit of a function at a point.

Theorem 1. *Evaluating the limit of a function at a point $x = a$:*

$$\lim_{x \rightarrow a} (f(x)) = L$$

if and only if

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

*Note: The limit **exists** if L is a Real number. The limit can be equal to ∞ or $-\infty$, but we would not say that it exists. If the left- and right-hand limits do not agree, we say **the limit does not exist** (or DNE for short).*

This objective will allow you to practice evaluating the left- and right-hand limits to determine if the limit at a point exists. **This would be where you want to practice before the exam.**

Answers are either a Real number, ∞ , $-\infty$, or DNE.

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

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

$$\lim_{x \rightarrow \infty} f(x) =$$

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

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

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

$$\lim_{x \rightarrow 3} f(x) =$$

Learning outcomes:
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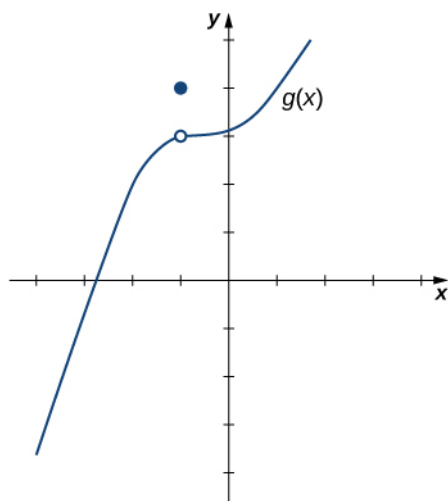


Figure 1: Function with a hole at $x = -1$.

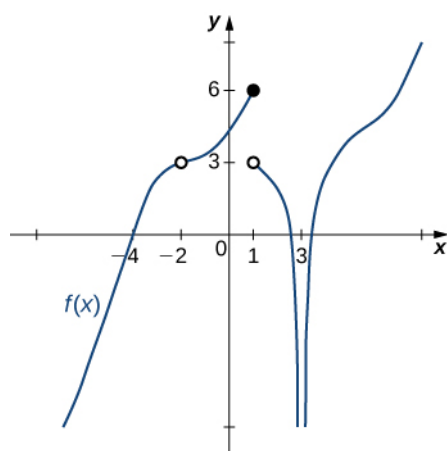


Figure 2: Piecewise function to evaluate.

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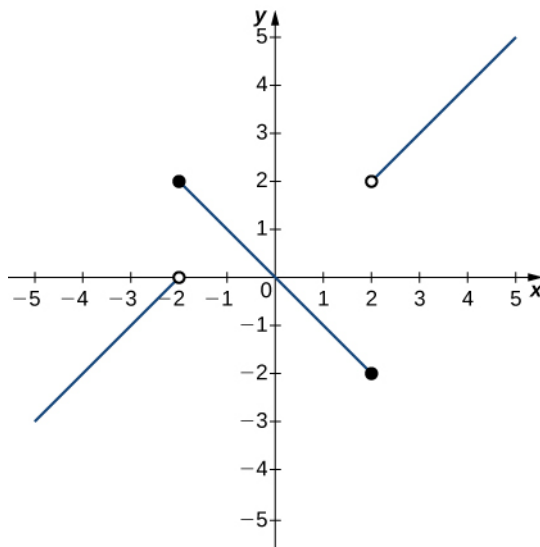


Figure 3: Piecewise function to evaluate.

$$\lim_{x \rightarrow \infty} f(x) = \boxed{+\infty}$$

Question 3 $\lim_{x \rightarrow -\infty} f(x) = \boxed{-\infty}$

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

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

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

$$\lim_{x \rightarrow \infty} f(x) = \boxed{+\infty}$$

Question 4 $\lim_{x \rightarrow -\infty} f(x) = \boxed{+\infty}$

$$\lim_{x \rightarrow -8} f(x) = \boxed{-6}$$

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

$$\lim_{x \rightarrow 6} f(x) = \boxed{DNE}$$

$$\lim_{x \rightarrow 10} f(x) = \boxed{0}$$

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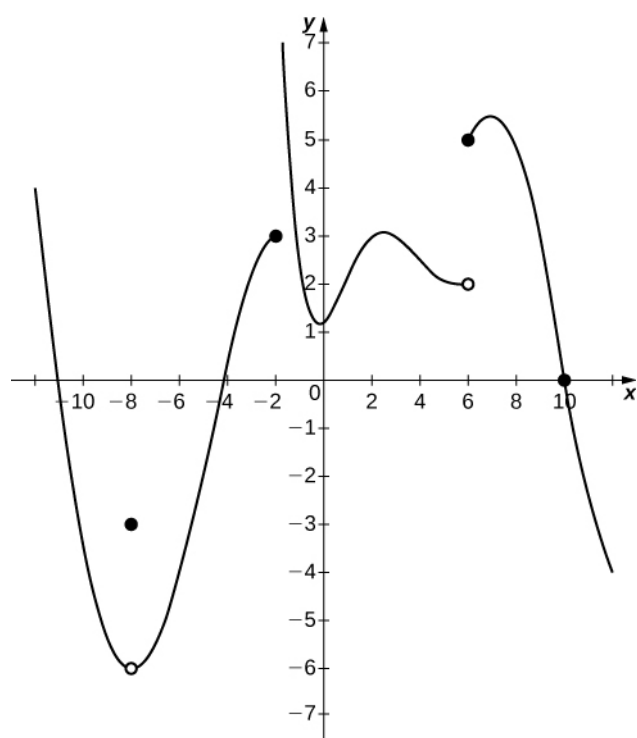


Figure 4: Piecewise function to evaluate.

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$$\lim_{x \rightarrow \infty} f(x) = \boxed{-\infty}$$

Question 5 $f(x) = \frac{6(2x-1)(x+1)}{-6x-6}$

$$\lim_{x \rightarrow -\infty} f(x) = \boxed{+\infty}$$

$$\lim_{x \rightarrow -1} f(x) = \boxed{3}$$

$$\lim_{x \rightarrow \frac{1}{2}} f(x) = \boxed{0}$$

$$\lim_{x \rightarrow \infty} f(x) = \boxed{-\infty}$$

Question 6 $f(x) = \frac{3x+4}{4(4x-3)(3x+4)}$

$$\lim_{x \rightarrow -\infty} f(x) = \boxed{0}$$

$$\lim_{x \rightarrow \frac{3}{4}} f(x) = \boxed{DNE}$$

$$\lim_{x \rightarrow -\frac{4}{3}} f(x) = \boxed{-\frac{3}{100}}$$

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

Question 7 $\lim_{x \rightarrow 0} (x+1)^{\left(\frac{1}{x}\right)} = \boxed{e}$

Hint: We can't plug in the exact value, so we will need to plug in values very near 0.

Question 8 $\lim_{x \rightarrow 7} \frac{\sqrt{x-3}-2}{x-7} = \boxed{\frac{1}{4}}$

Hint: We can't plug in the exact value, so we will need to plug in values very near 7.