

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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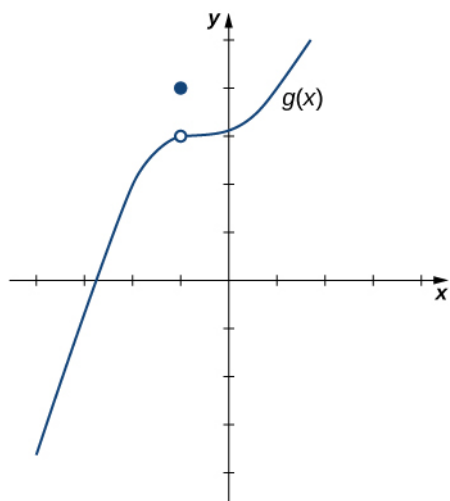


Figure 1: Function with a hole at $x = -1$.

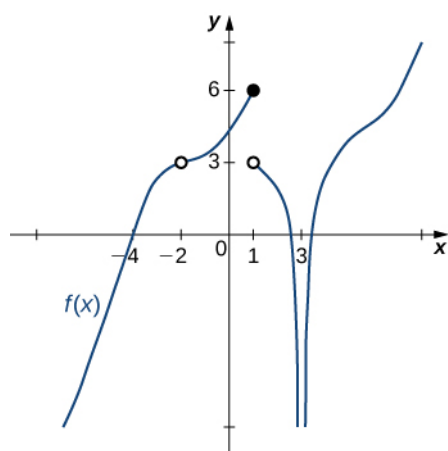


Figure 2: Piecewise function to evaluate.

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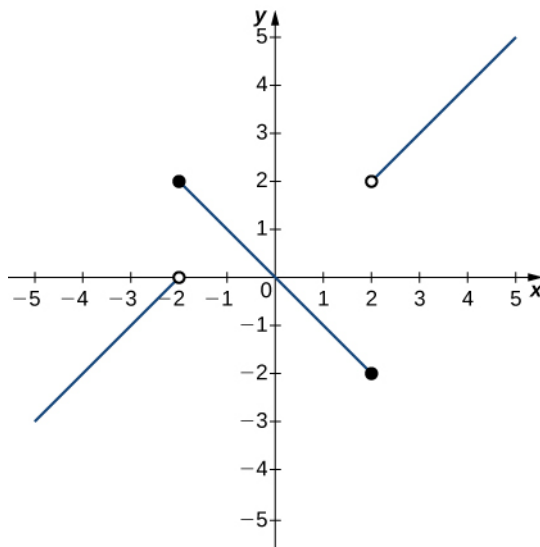


Figure 3: Piecewise function to evaluate.

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

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

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

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

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

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

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

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

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

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

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

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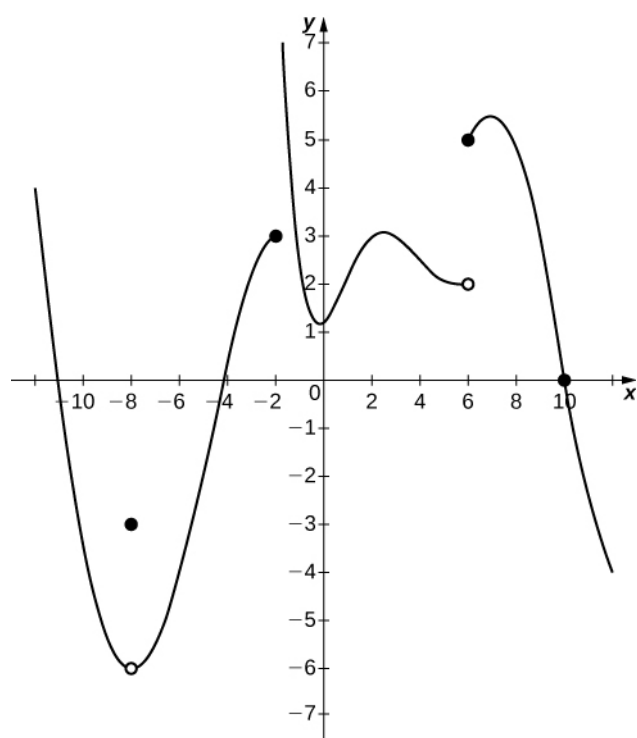


Figure 4: Piecewise function to evaluate.

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

Question 5 $f(x) = \frac{??}{??}$

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

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

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

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

Question 6 $f(x) = \frac{??}{??}$

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

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

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

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

Question 7 $\lim_{x \rightarrow ??} ?? = \boxed{??}$

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

Question 8 $\lim_{x \rightarrow ??} \frac{\sqrt{x - ??} - ??}{x - ??} = \boxed{??}$

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