

11.2 Exercises

See www.CalcChat.com for worked-out solutions to odd-numbered exercises. For instructions on how to use a graphing utility, see Appendix A.

Vocabulary and Concept Check

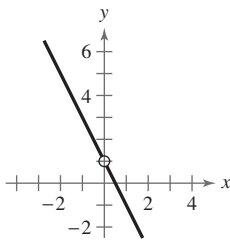
In Exercises 1 and 2, fill in the blank.

- To find a limit of a rational function that has common factors in its numerator and denominator, use the _____.
- The expression $\frac{0}{0}$ has no meaning as a real number and is called an _____ because you cannot, from the form alone, determine the limit.
- Which algebraic technique can you use to find $\lim_{x \rightarrow 0} \frac{\sqrt{x+4} - 2}{x}$?
- Describe in words what is meant by $\lim_{x \rightarrow 0^+} f(x) = -2$.

Procedures and Problem Solving

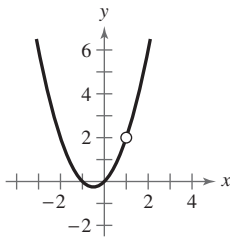
Using a Graph to Determine Limits In Exercises 5–8, use the graph to determine each limit (if it exists). Then identify another function that agrees with the given function at all but one point.

$$5. g(x) = \frac{-2x^2 + x}{x}$$



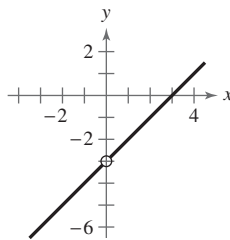
- $\lim_{x \rightarrow 0} g(x)$
- $\lim_{x \rightarrow -1} g(x)$
- $\lim_{x \rightarrow -2} g(x)$

$$7. g(x) = \frac{x^3 - x}{x - 1}$$



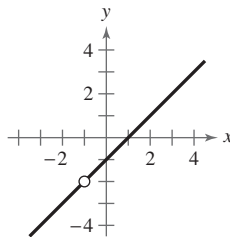
- $\lim_{x \rightarrow 1} g(x)$
- $\lim_{x \rightarrow -1} g(x)$
- $\lim_{x \rightarrow 0} g(x)$

$$6. h(x) = \frac{x^2 - 3x}{x}$$



- $\lim_{x \rightarrow -2} h(x)$
- $\lim_{x \rightarrow 0} h(x)$
- $\lim_{x \rightarrow 3} h(x)$

$$8. f(x) = \frac{x^2 - 1}{x + 1}$$



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

Finding a Limit In Exercises 9–36, find the limit (if it exists). Use a graphing utility to confirm your result graphically.

- $\lim_{x \rightarrow 6} \frac{x - 6}{x^2 - 36}$
- $\lim_{x \rightarrow 9} \frac{9 - x}{x^2 - 81}$
- $\lim_{x \rightarrow 2} \frac{x^2 - x - 2}{x - 2}$
- $\lim_{x \rightarrow -1} \frac{1 - 2x - 3x^2}{1 + x}$
- $\lim_{t \rightarrow 2} \frac{t^3 - 8}{t - 2}$
- $\lim_{x \rightarrow 2} \frac{x^5 - 32}{x - 2}$
- $\lim_{x \rightarrow -4} \frac{x^2 + x - 12}{x^2 + 6x + 8}$
- $\lim_{x \rightarrow -1} \frac{x^3 + 2x^2 - x - 2}{x^3 + 4x^2 - x - 4}$
- $\lim_{y \rightarrow 0} \frac{\sqrt{5+y} - \sqrt{5}}{y}$
- $\lim_{x \rightarrow -3} \frac{\sqrt{x+7} - 2}{x+3}$
- $\lim_{x \rightarrow 0} \frac{\frac{1}{x+1} - 1}{x}$
- $\lim_{x \rightarrow 0} \frac{\frac{1}{x+4} - \frac{1}{4}}{x}$
- $\lim_{x \rightarrow \pi/2} \frac{1 - \sin x}{\cos x}$
- $\lim_{x \rightarrow 0} \frac{\cos 2x}{\cot 2x}$
- $\lim_{x \rightarrow \pi/2} \frac{\sin x - 1}{x}$
- $\lim_{x \rightarrow 9} \frac{9 - x}{x^2 - 81}$
- $\lim_{x \rightarrow -1} \frac{x^2 + 6x + 5}{x + 1}$
- $\lim_{x \rightarrow -4} \frac{2x^2 + 7x - 4}{x + 4}$
- $\lim_{a \rightarrow -4} \frac{a^3 + 64}{a + 4}$
- $\lim_{x \rightarrow 1} \frac{x^4 - 1}{x - 1}$
- $\lim_{x \rightarrow 3} \frac{x^2 - 8x + 15}{x^2 - 2x - 3}$
- $\lim_{x \rightarrow -3} \frac{x^3 + 2x^2 - 9x - 18}{x^3 + x^2 - 9x - 9}$
- $\lim_{z \rightarrow 0} \frac{\sqrt{7-z} - \sqrt{7}}{z}$
- $\lim_{x \rightarrow 2} \frac{4 - \sqrt{18-x}}{x - 2}$
- $\lim_{x \rightarrow 0} \frac{\frac{1}{x-8} + \frac{1}{8}}{x}$
- $\lim_{x \rightarrow 0} \frac{\frac{1}{2+x} - \frac{1}{2}}{x}$
- $\lim_{x \rightarrow 0} \frac{\cos x - 1}{\sin x}$
- $\lim_{x \rightarrow \pi} \frac{\sin x}{\csc x}$
- $\lim_{x \rightarrow \pi} \frac{1 + \cos x}{x}$