

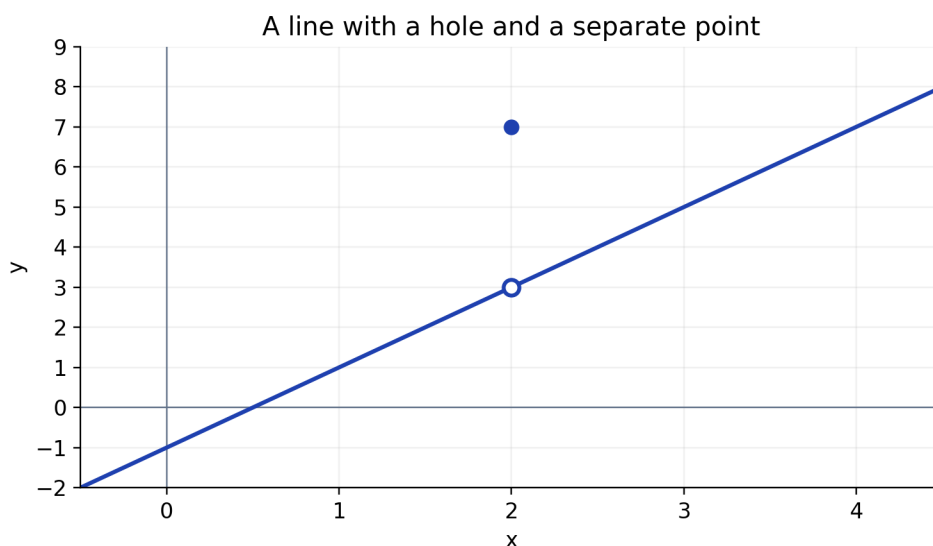
Lesson 1.1 · Practice

No calculator required | Name: _____

1. For $f(x) = \frac{x^2 - 9}{x - 3}$, $x \neq 3$, make a table at $x = 2.9, 2.99, 3.01, 3.1$. Estimate $\lim_{x \rightarrow 3} f(x)$.

2. Use the graph of f below. It follows $y = 2x - 1$, with an open circle at $(2, 3)$ and a filled dot at $(2, 7)$.

Find $\lim_{x \rightarrow 2^-} f(x)$, $\lim_{x \rightarrow 2^+} f(x)$, $\lim_{x \rightarrow 2} f(x)$, and $f(2)$.

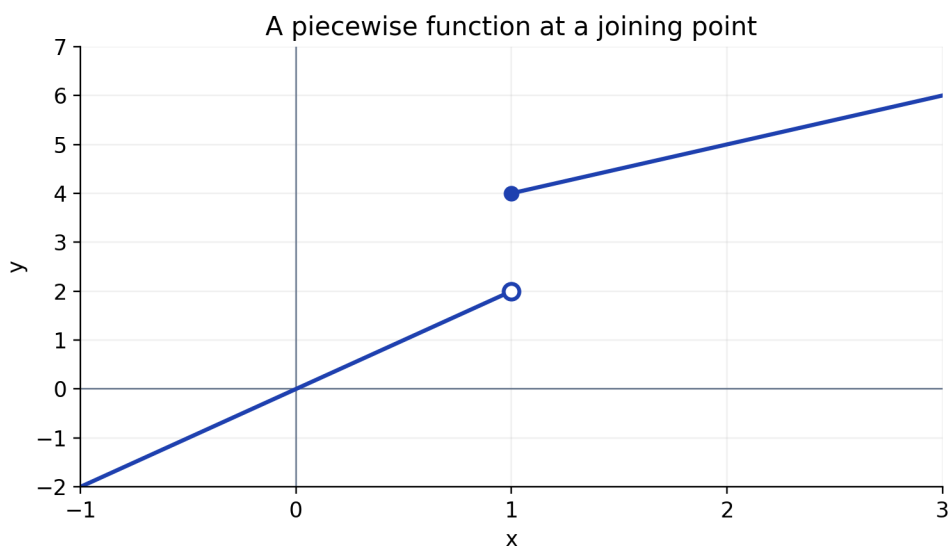


Trace the line toward $x = 2$ from both directions.

Lesson 1.1 · Practice

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3. Let $p(x) = 2x$ for $x < 1$ and $p(x) = x + 3$ for $x \geq 1$. Use the graph and the formulas to find both one-sided limits at 1. Does $\lim_{x \rightarrow 1} p(x)$ exist?



Open and filled endpoints identify which branch includes the join.

4. For $s(t) = t^2 + 2t$, the average velocity on $[1, 1 + h]$ is $\frac{s(1+h) - s(1)}{h} = 4 + h$ for $h \neq 0$. Evaluate it for $h = 0.1, 0.01, -0.01$. Find the instantaneous velocity $s'(1)$.

Lesson 1.2 · Practice

No calculator required | Name: _____

5. Evaluate $\lim_{x \rightarrow -1} (2x^2 - 3x + 4)$. Explain why substitution works.

6. Evaluate $\lim_{x \rightarrow 4} \frac{x^2 - 16}{x - 4}$. Show the factorization and restriction.

7. Evaluate $\lim_{x \rightarrow 0} \frac{\sqrt{16+x} - 4}{x}$. Show the conjugate step.

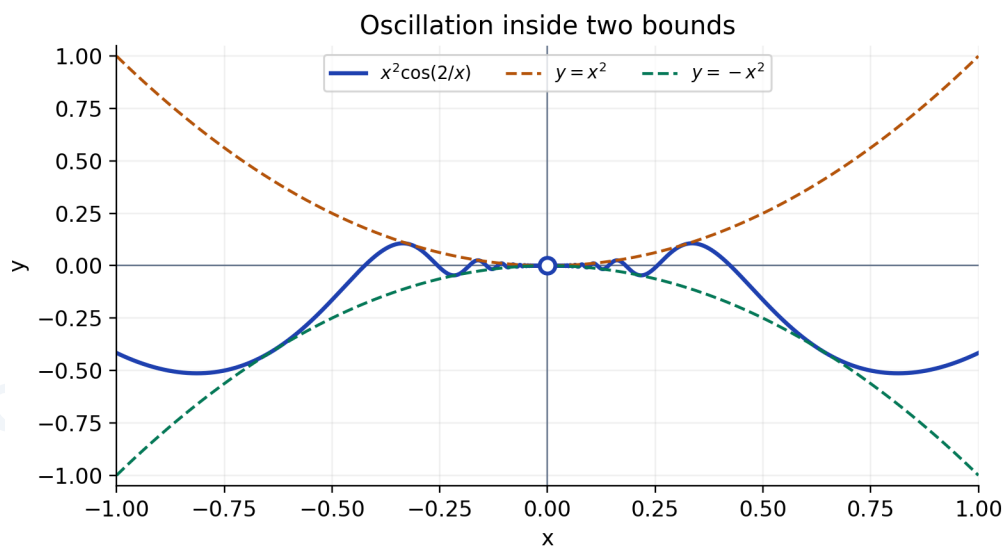
8. Evaluate $\lim_{x \rightarrow 2} \frac{x^2 - 5x + 6}{x^2 - 4}$. Explain why the function need not be defined at 2.

Lesson 1.3 · Practice

No calculator required | Name: _____

9. Suppose $4 - x^2 \leq f(x) \leq 4 + 2x^2$ near 0. Find $\lim_{x \rightarrow 0} f(x)$ and name the theorem.

10. Evaluate $\lim_{x \rightarrow 0} x^2 \cos\left(\frac{2}{x}\right)$. Justify your answer with bounds.



Compare the oscillating curve with the two bounding parabolas.

Lesson 1.3 · Practice

No calculator required | Name: _____

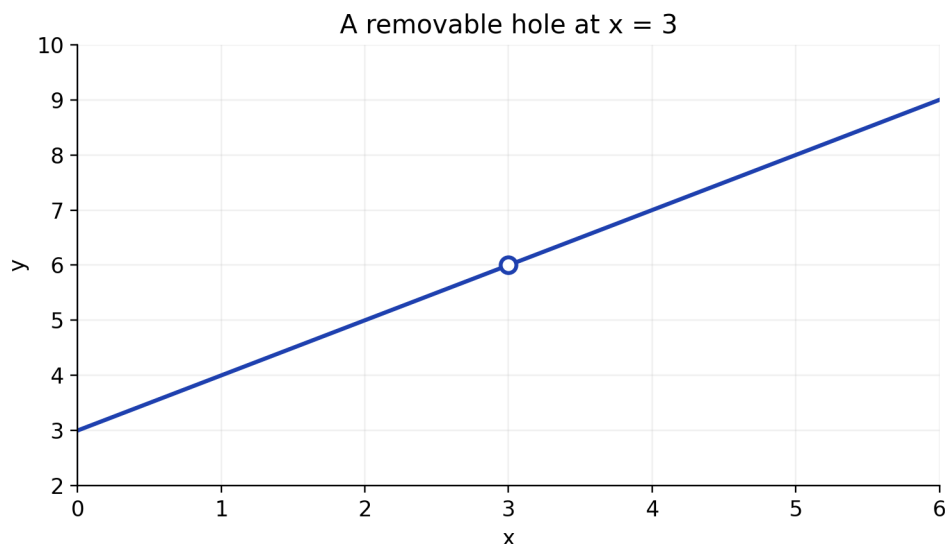
11. Evaluate $\lim_{x \rightarrow 0} \frac{\sin(6x)}{4x}$ in radians. Rewrite it using the standard trigonometric limit.

12. You know only that $-1 \leq q(x) \leq 1$ near 0. Must $\lim_{x \rightarrow 0} q(x)$ exist? Give a counterexample.

Lesson 1.4 · Practice

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13. Let $f(x) = \frac{x^2 - 9}{x - 3}$ for $x \neq 3$, and $f(3) = k$. Find k for continuity. Classify the break if $k = 0$.



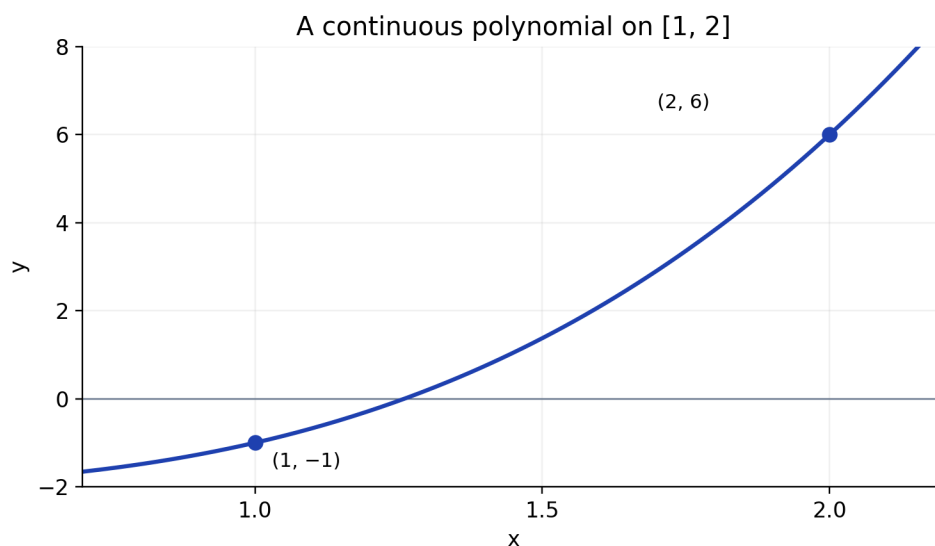
The open circle shows the value missing from the rational expression.

14. Let $f(x) = ax + 2$ for $x < 1$, and $f(x) = x^2 + 4$ for $x \geq 1$. Find a so that f is continuous at 1.

Lesson 1.4 · Practice

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- 15.** Use the Intermediate Value Theorem to justify a root of $f(x) = x^3 - 2$ between 1 and 2. Does IVT alone prove uniqueness?



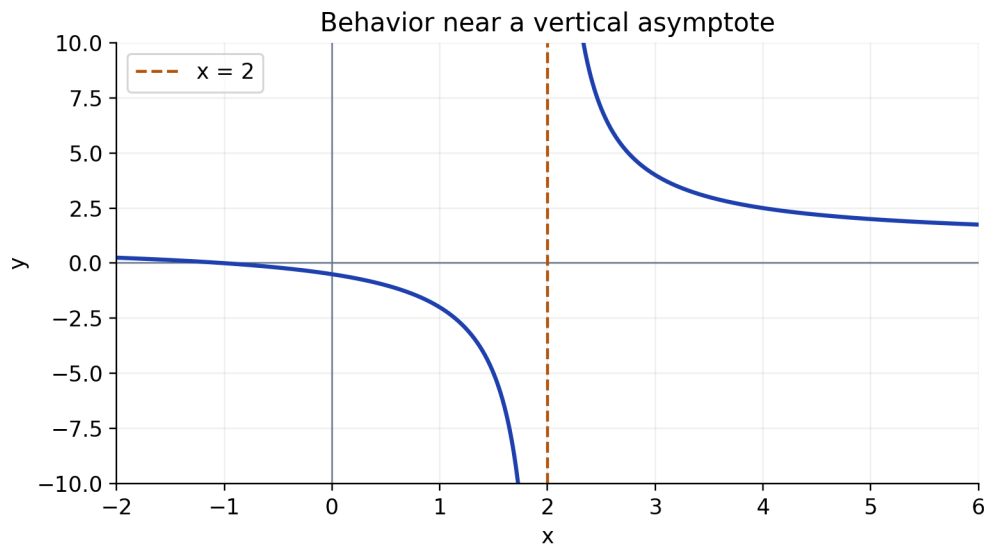
Use continuity and the signs of the endpoint values.

- 16.** Explain why $\sqrt{x+2}$ is continuous on $[-2, 2]$. Then explain why IVT cannot be applied to $\frac{1}{x-1}$ on $[0, 2]$.

Lesson 1.5 · Practice

No calculator required | Name: _____

17. Find $\lim_{x \rightarrow 2^-} \frac{x+1}{x-2}$ and $\lim_{x \rightarrow 2^+} \frac{x+1}{x-2}$. Does the two-sided limit exist? Identify the vertical asymptote.



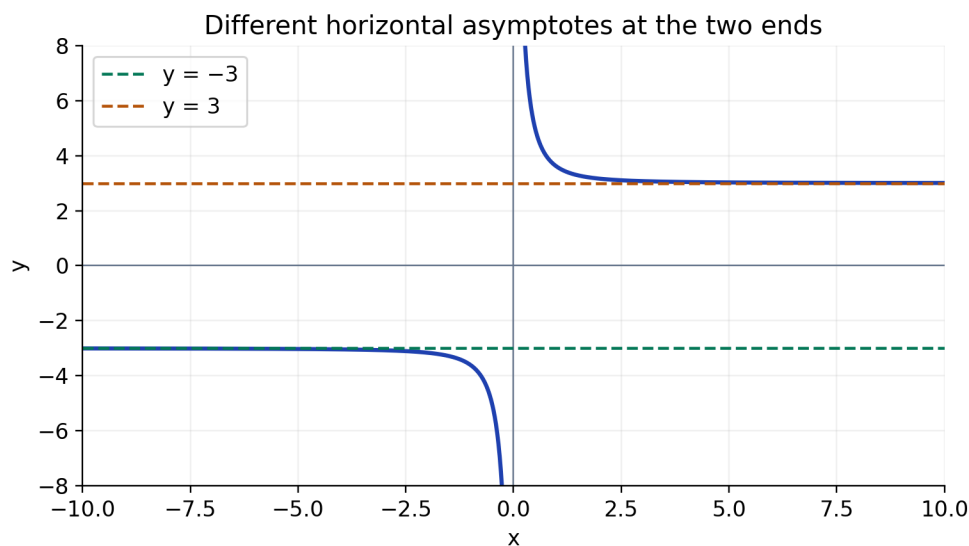
Follow each branch as x approaches the dashed line.

18. Evaluate $\lim_{x \rightarrow +\infty} \frac{5x^2 - 3}{2x^2 + 7x}$. Identify the horizontal asymptote.

Lesson 1.5 · Practice

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19. Evaluate $\lim_{x \rightarrow -\infty} \frac{\sqrt{9x^2 + 4}}{x}$. Explain the sign.

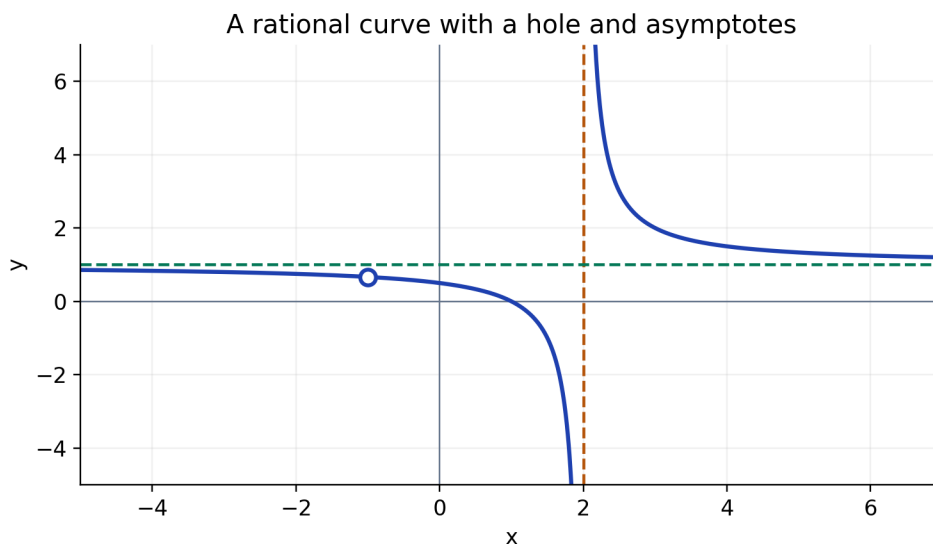


Compare end behavior on the negative and positive sides.

Lesson 1.5 · Practice

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20. For $f(x) = \frac{x^2 - 1}{x^2 - x - 2}$, classify the excluded inputs and find both end limits.



A canceled factor creates a hole; the remaining denominator factor creates an asymptote.