MATHEMATICS · GRADES 10-12

Evaluating limits algebraically

Difficulty level: Advanced

Mathematics: Grades 10-12

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Overview of the concept

This is how you work out the value a quantity is heading toward. A loan balance heads toward zero as you keep paying it down, and a car's speed heads toward zero as it slows to a stop. The limit tells you where things are going, even if they never quite get there. It is how you describe a trend that is still in progress.



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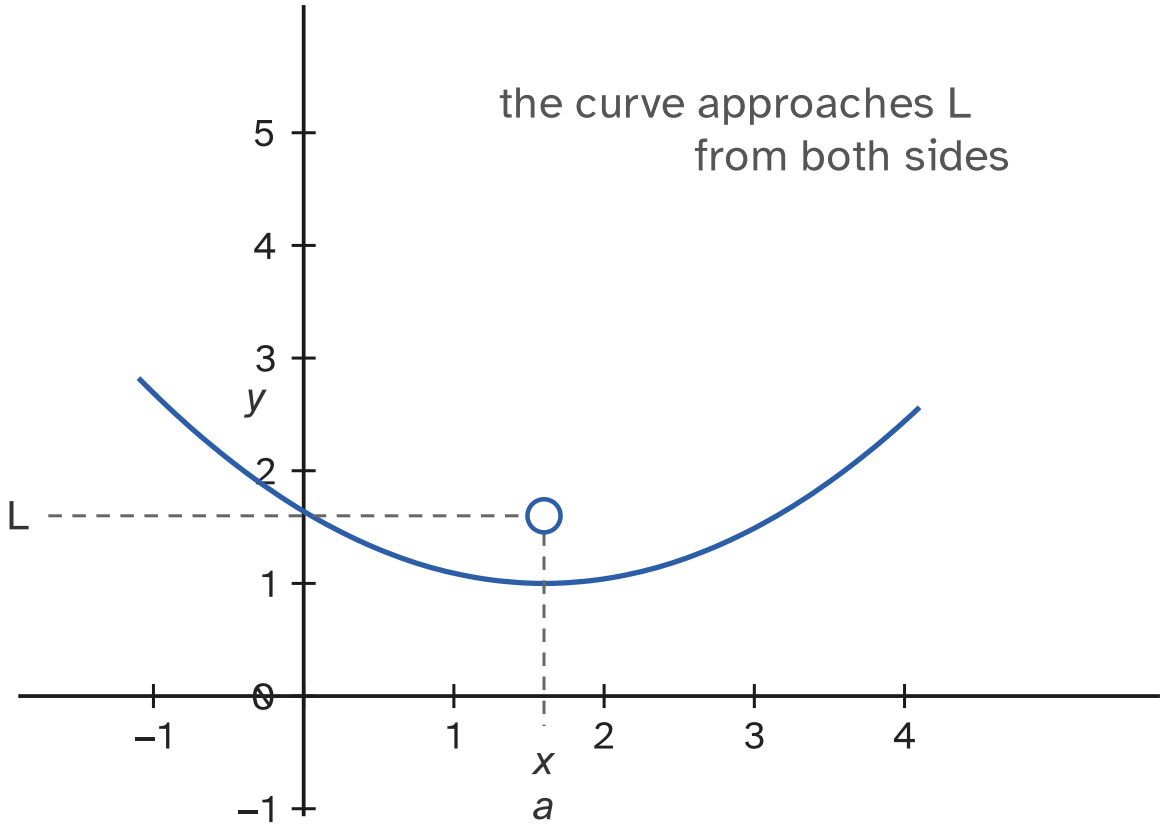

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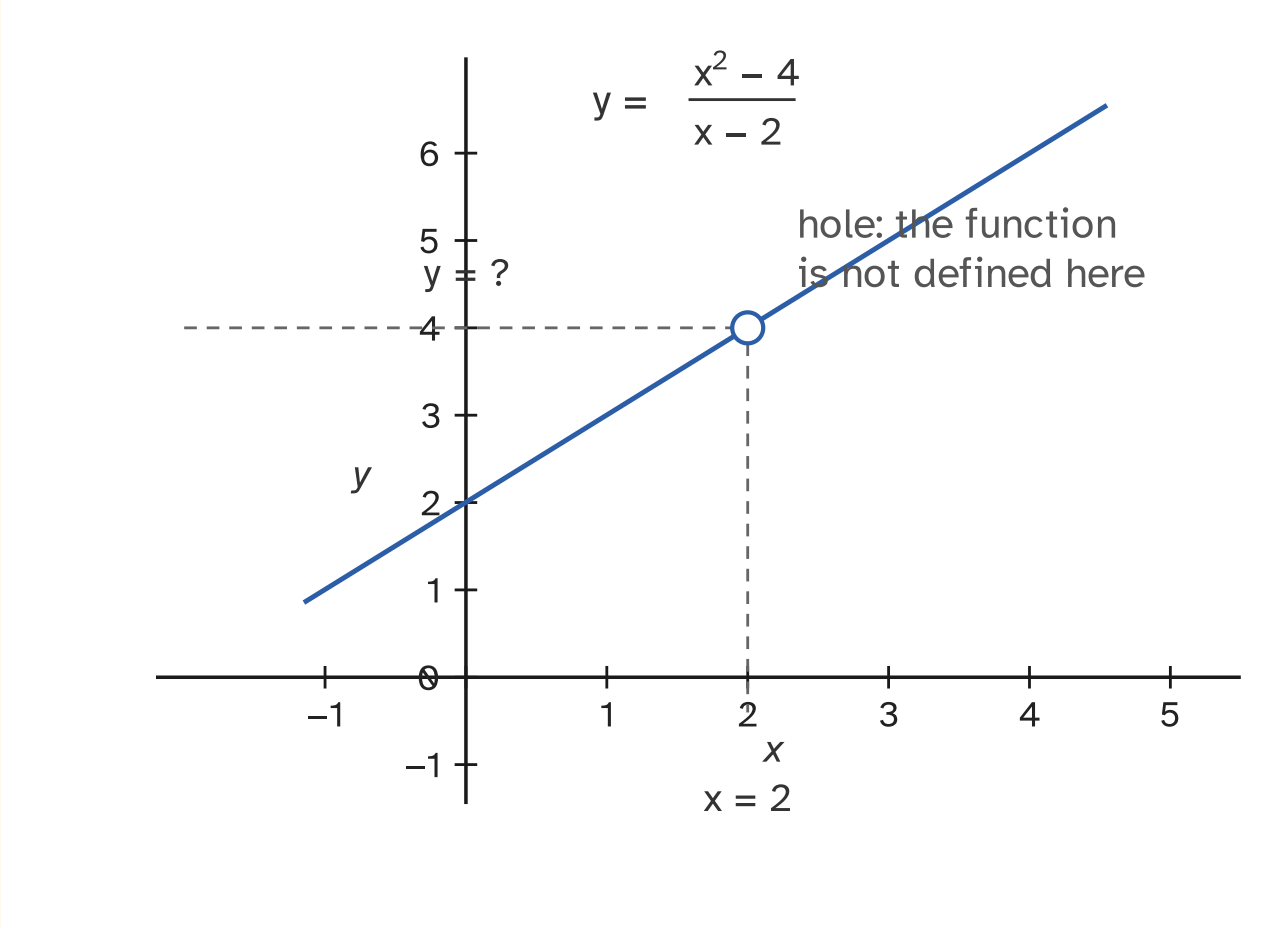
Worked examples

EXAMPLE 1

Q Evaluate the limit as x approaches 2 of



SOLUTION

Direct substitution gives $\frac{0}{0}$, so factor the top: $(x - 2)(x + 2)$

Cancel the common factor $(x - 2)$, leaving $x + 2$

Put $x = 2$: the limit is 4

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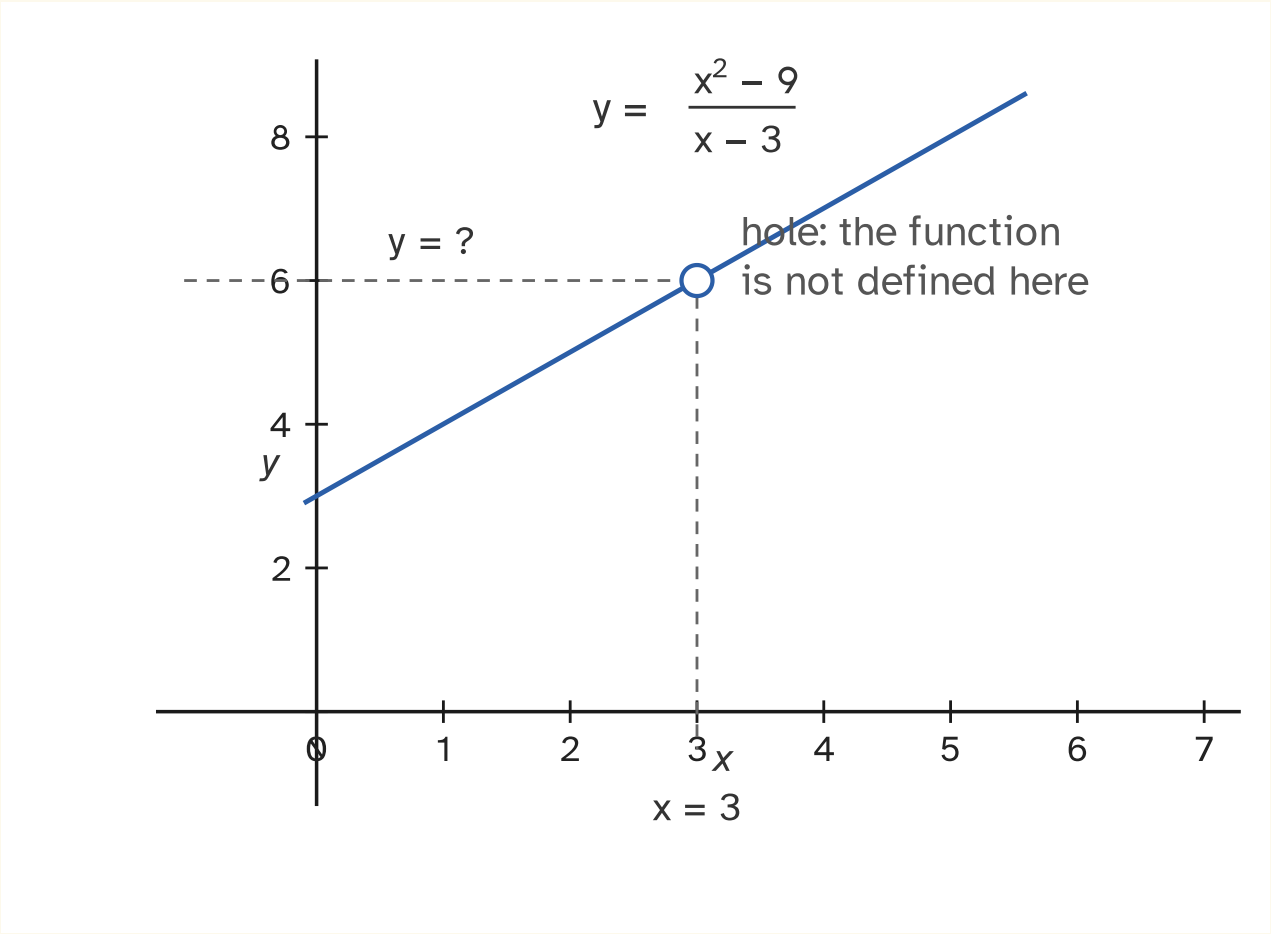
EXAMPLE 2

Q Evaluate the limit as x approaches 3 of



SOLUTION

Factor the top: (x – 3)(x + 3)

Cancel (x – 3), leaving x + 3

Put x = 3: the limit is 6

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Practice questions

1 What is the limit as x approaches 1 of $\frac{(x^2 - 1)}{(x - 1)}$?

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2 What is the limit as x approaches 4 of $x^2 + 1$?

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3 What is the limit as x approaches 0 of $\frac{3x}{x}$.

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4 What is the limit as x approaches 5 of $\frac{(2x - 10)}{(x - 5)}$?

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5 When you meet a new limit, what is the first thing to try?

A. Direct substitution

B. Factoring first

C. Multiplying by the conjugate

D. Using a table of values

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6 Find the limit as x approaches 2 of $\frac{(x^3 - 8)}{(x - 2)}$.

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7 What is the limit as x approaches 1 of $\frac{(x - 1)}{(x - 1)}$?

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8 What is the limit as x approaches 0 of $\frac{(x^2 + x)}{x}$.

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9 Direct substitution gives $\frac{0}{0}$. What does that tell you?

- **A** An indeterminate form: more work is needed
- **B** The limit does not exist
- **C** The limit is 0
- **D** Direct substitution always works

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10 What is the limit as x approaches 3 of $\frac{(x^2 + 2x - 15)}{(x - 3)}$?

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ANSWER KEY

1. 2

2. 17

3. 3

4. 2

5. Direct substitution

6. 12

7. 1

8. 1

9. An indeterminate form: more work is needed

10. 8

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