MATHEMATICS · GRADES 10-12

Intercepts and asymptotes

Difficulty level: Advanced

Mathematics: Grades 10-12

This document was made by AI and there may be mistakes. If a question or answer looks wrong, use the Flag a mistake button to let Brett know so he can fix it.

Overview of the concept

This is how you frame a graph by where it starts and the line it approaches but never reaches, like the temperature of a cooling cup approaching room temperature. The intercepts tell you where the graph begins or crosses the axes, and the asymptote is the value it creeps toward forever without ever touching. You see it in a cup of coffee cooling down, a population levelling off, or a machine warming up toward its steady running temperature.



© 2026 Brett Robbins. All Rights Reserved.

Worked examples

EXAMPLE 1

Q Find the intercepts and asymptotes of $f(x) = \frac{1}{x}$

SOLUTION

Intercepts: setting $x = 0$ is not allowed, and $\frac{1}{x}$ is never 0, so there are no intercepts.

Vertical asymptote: the denominator is zero at $x = 0$, so $x = 0$ is a vertical asymptote.

Horizontal asymptote: as x grows large, $\frac{1}{x}$ gets close to 0, so $y = 0$ is a horizontal asymptote.

EXAMPLE 2

Q Find the intercepts of $y = 2x - 6$

SOLUTION

For the y-intercept, set $x = 0$: $y = -6$, so the point is $(0, -6)$.

For the x-intercept, set $y = 0$: $2x - 6 = 0$, so $x = 3$.

So the x-intercept is $(3, 0)$ and the y-intercept is $(0, -6)$. This line has no asymptotes.

© 2026 Brett Robbins. All Rights Reserved.

Practice questions

1 Find the intercepts and asymptotes of $f(x) = \frac{2}{x}$.

- **A** No intercepts; vertical asymptote $x = 0$, horizontal asymptote $y = 0$
- **B** x-intercept $(0, 0)$, y-intercept $(0, 0)$; no asymptotes
- **C** No intercepts; vertical asymptote $x = 2$, horizontal asymptote $y = 0$
- **D** x-intercept $(2, 0)$, y-intercept $(0, 2)$; no asymptotes

Understand It with Pulse | Flag a mistake

© 2026 Brett Robbins. All Rights Reserved.

2 Find the intercepts of $y = 3x - 6$

A. x-intercept (3, 0), y-intercept (0, -6); no asymptotes

B. x-intercept (2, 0), y-intercept (0, -6); no asymptotes

C. x-intercept (2, 0), y-intercept (0, 6); no asymptotes

D. x-intercept (6, 0), y-intercept (0, -6); no asymptotes

Understand It with Pulse | Flag a mistake

3 What happens to $f(x) = \frac{1}{(x - 2)}$ as x gets very large?

A. It gets close to 0

B. It gets very large

C. It equals 2

D. It becomes negative

Understand It with Pulse | Flag a mistake

© 2026 Brett Robbins. All Rights Reserved.

4 A line crosses the y-axis at (0, -9) and the x-axis at (3, 0). What is its equation?

- **A** y = 3x - 9
- **B** y = 3x + 9
- **C** y = -3x - 9
- **D** y = x - 9

Understand It with Pulse | Flag a mistake

5 Does the graph of $f(x) = \frac{2}{(x + 1)}$ ever cross its horizontal asymptote y = 0?

- **A** No
- **B** Yes, at x = -1
- **C** Yes, at x = 0
- **D** Yes, at x = 1

Understand It with Pulse | Flag a mistake

© 2026 Brett Robbins. All Rights Reserved.

6 Which line has x-intercept (4, 0)?

A $y = x - 4$

B $y = x + 4$

C $y = 4x$

D $y = -x - 4$

Understand It with Pulse | Flag a mistake

7 Find the y-intercept of $f(x) = \frac{1}{(x + 3)}$.

A $(0, \frac{1}{3})$

B $(0, 3)$

C $(0, -3)$

D There is no y-intercept

Understand It with Pulse | Flag a mistake

© 2026 Brett Robbins. All Rights Reserved.

8 A line has y-intercept (0, 8) and gradient -2. What is its x-intercept?

- **A** (4, 0)
- **B** (-4, 0)
- **C** (8, 0)
- **D** (0, 4)

Understand It with Pulse | Flag a mistake

9 Find the y-intercept of $y = x^2 - 5$

- **A** (0, 5)
- **B** (0, -5)
- **C** (-5, 0)
- **D** (5, 0)

Understand It with Pulse | Flag a mistake

© 2026 Brett Robbins. All Rights Reserved.

10

Find the x-intercepts of $y = x^2 - 4$

A (2, 0) and (-2, 0)

B (0, 2) and (0, -2)

C (2, 0) only

D (4, 0) and (-4, 0)

Understand It with Pulse

Flag a mistake

© 2026 Brett Robbins. All Rights Reserved.

ANSWER KEY

1. No intercepts; vertical asymptote x = 0, horizontal asymptote y = 0

2. x-intercept (2, 0), y-intercept (0, -6); no asymptotes

3. It gets close to 0

4. y = 3x - 9

5. No

6. y = x - 4

7. $(0, \frac{1}{3})$

8. (4, 0)

9. (0, -5)

10. (2, 0) and (-2, 0)

© 2026 Brett Robbins. All Rights Reserved.