MATHEMATICS · GRADES 10-12

Determining whether a graph represents a function

Difficulty level: Advanced

Mathematics: Grades 10-12

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Overview of the concept

This is how you check whether a graph gives one clear answer for each input. A vending machine should give one snack for each button you press, and a function should give one output for each input. If one input gives two different answers, the graph is not a function and you cannot trust it to predict anything. It is a quick check that saves you from using a rule that does not actually work.



Rule

A graph is a function only if every input has exactly one output.

A vertical line must hit the graph at most once. If one vertical line hits the graph twice, one input gives two outputs and the graph is not a function.

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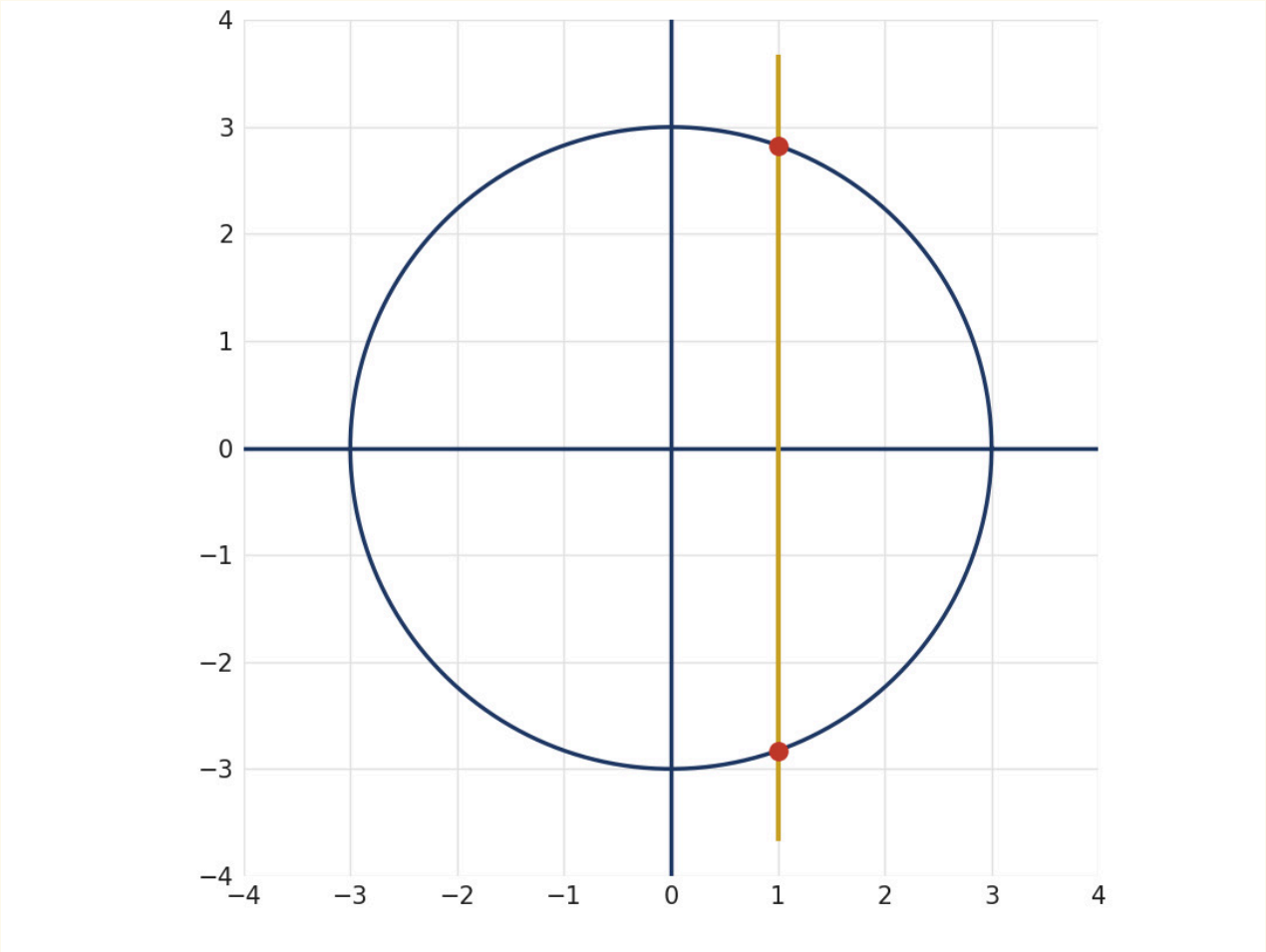
Worked examples

EXAMPLE 1

Q Does the graph of a circle represent a function?



SOLUTION

Pick an x-value in the middle of the circle.

A vertical line there hits the circle twice: once at the top and once at the bottom.

One input gives two outputs, so no, it is not a function.

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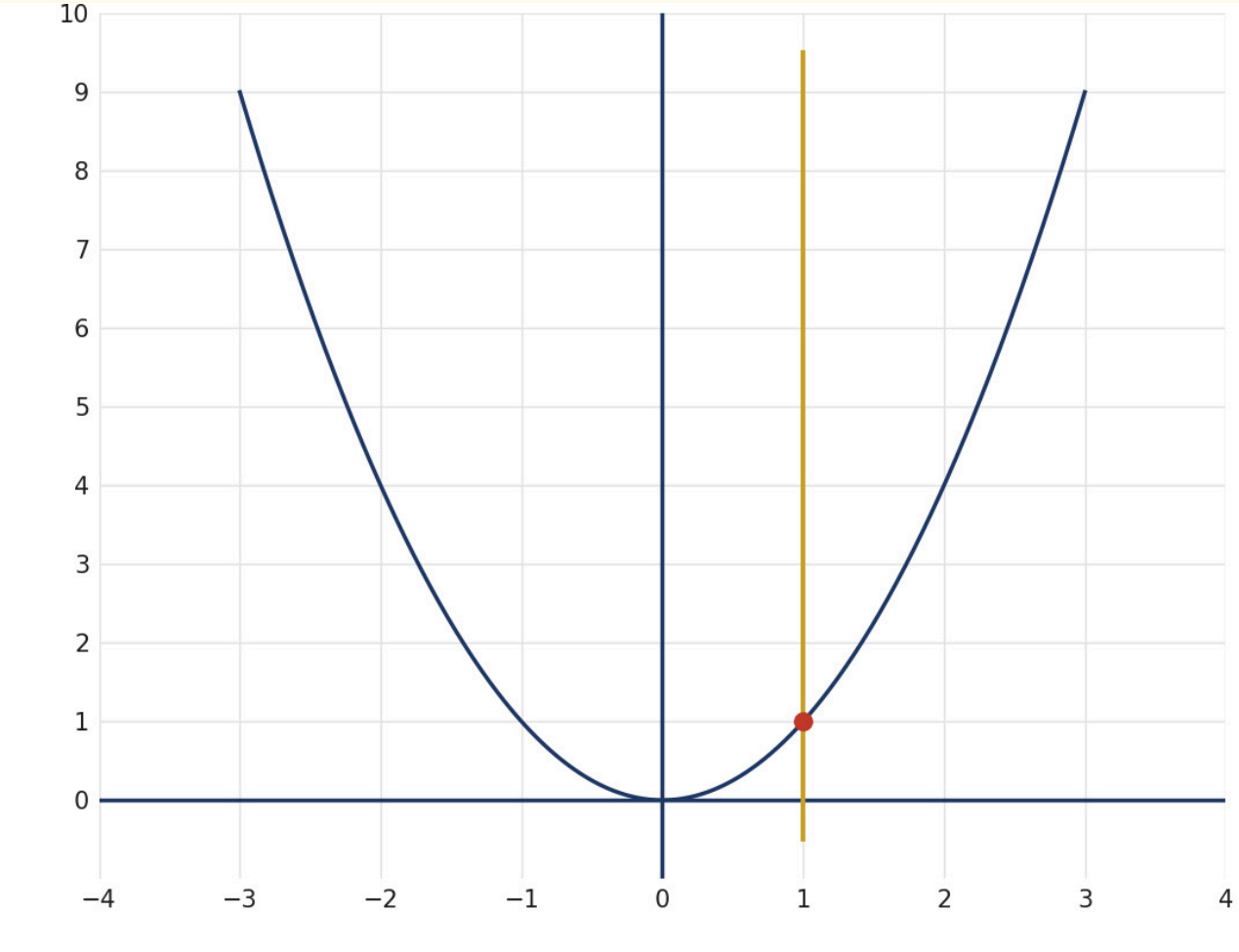
EXAMPLE 2

Q Does the graph of $y = x^2$ represent a function?



SOLUTION

Pick any x-value.

A vertical line there hits the parabola exactly once.

Every input gives one output, so yes, it is a function.

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Practice questions

1 **An oval shape has a vertical line through it. Does the oval represent a function? Answer yes or no.**

A Yes

B No

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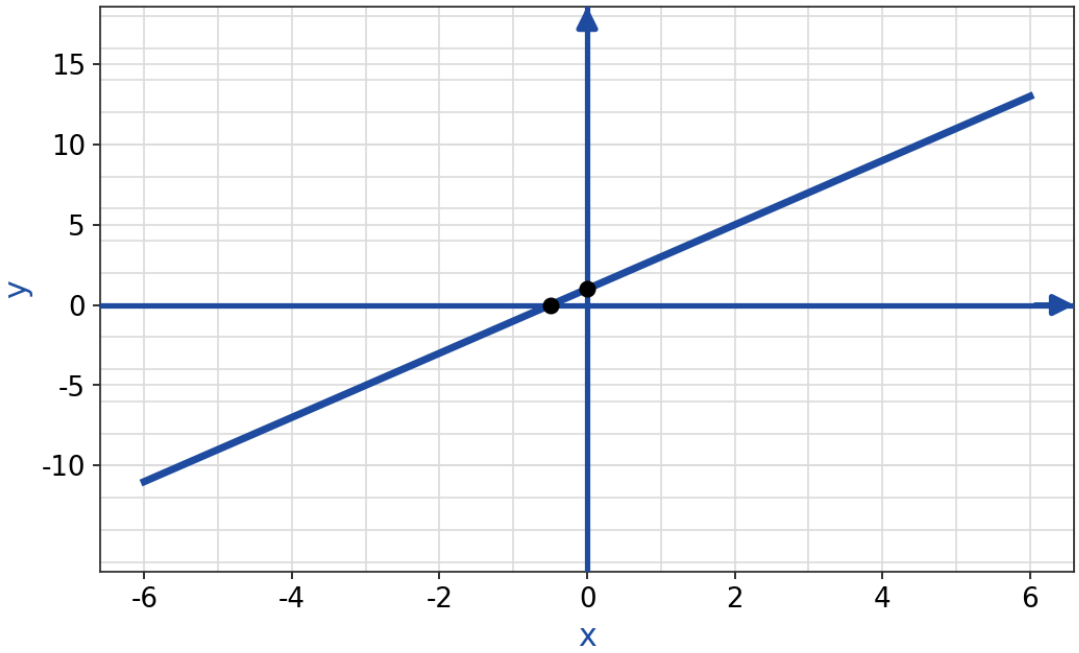
2 The straight line $y = 2x + 1$ is graphed. Does it represent a function? Answer yes or no.



A Yes

B No

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3

Does the vertical line x = 3 represent a function? Answer yes or no.

A Yes

B No

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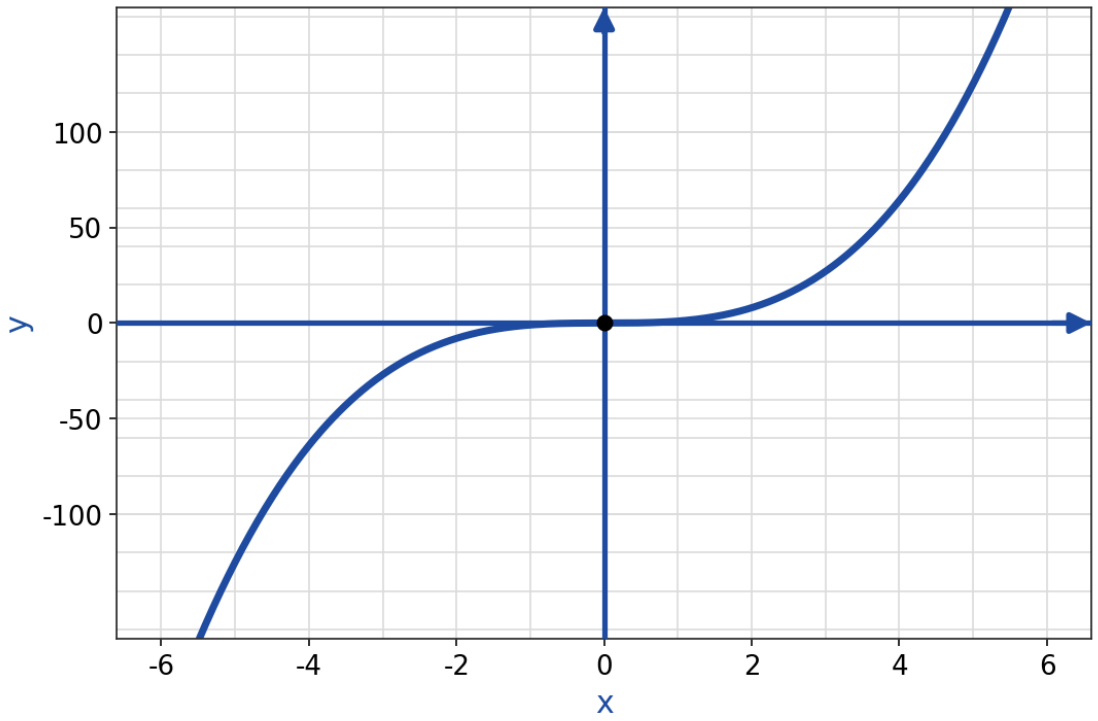
4 The cubic $y = x^3$ is graphed. Does it represent a function? Answer yes or no.



A Yes

B No

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5 $x = y^2$. Does it represent a function? Answer yes or no.

A Yes

B No

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6 Does the horizontal line $y = 5$ represent a function? Answer yes or no.

A Yes

B No

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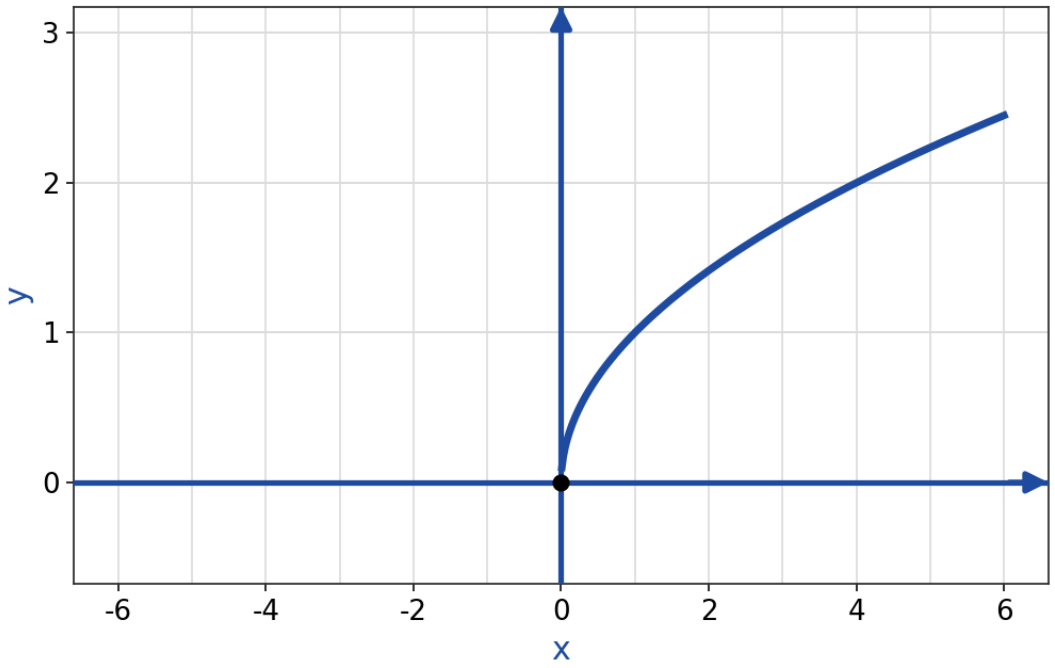
7 The square root curve $y = \sqrt{x}$ is graphed. Does it represent a function? Answer yes or no.



A No

B Yes

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8

A vertical line crosses a graph at two points. Does the graph represent a function? Answer yes or no.

A Yes

B No

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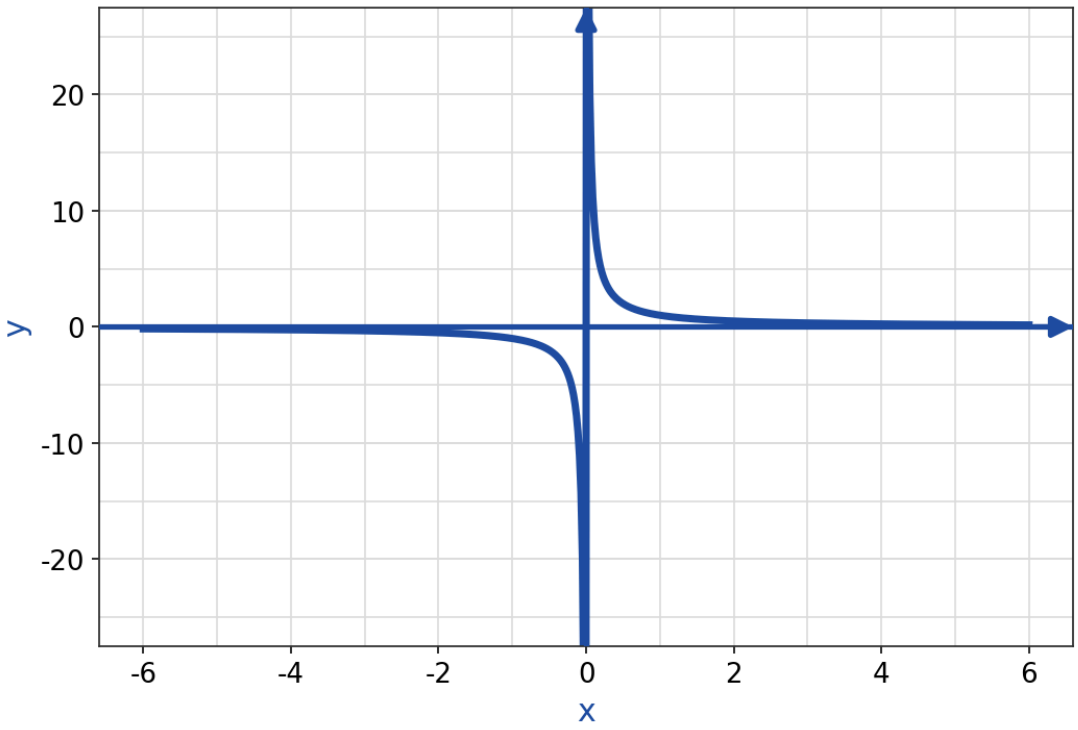
9 The hyperbola $y = \frac{1}{x}$ is graphed. Does it represent a function? Answer yes or no.



A Yes

B No

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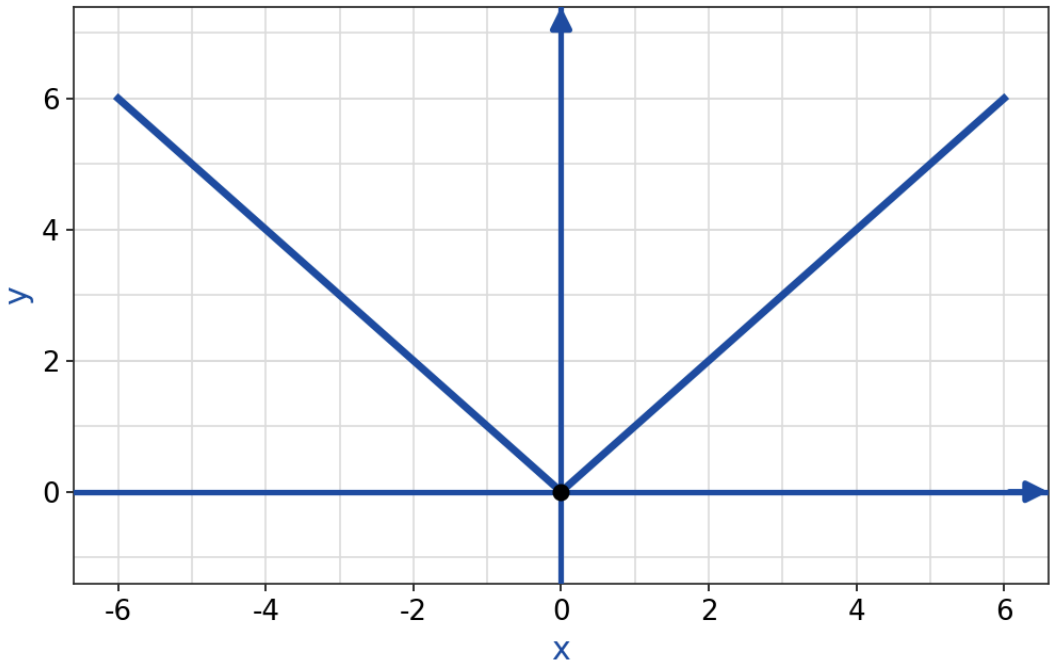
10 **The V shape y = |x| is graphed. Does it represent a function? Answer yes or no.**



A No

B Yes

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ANSWER KEY

1. No

2. Yes

3. No

4. Yes

5. No

6. Yes

7. Yes

8. No

9. Yes

10. Yes

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