MATHEMATICS · GRADES 10-12

Domain and range

Difficulty level: Advanced

Mathematics: Grades 10-12

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Overview of the concept

This is how you know what inputs and outputs make sense for a rule. A recipe only works for a certain number of servings, and a phone plan only charges for the minutes you actually use. Values outside that sensible range give answers that mean nothing in real life. Checking the range first stops you from trusting an answer that looks right on paper but makes no sense.

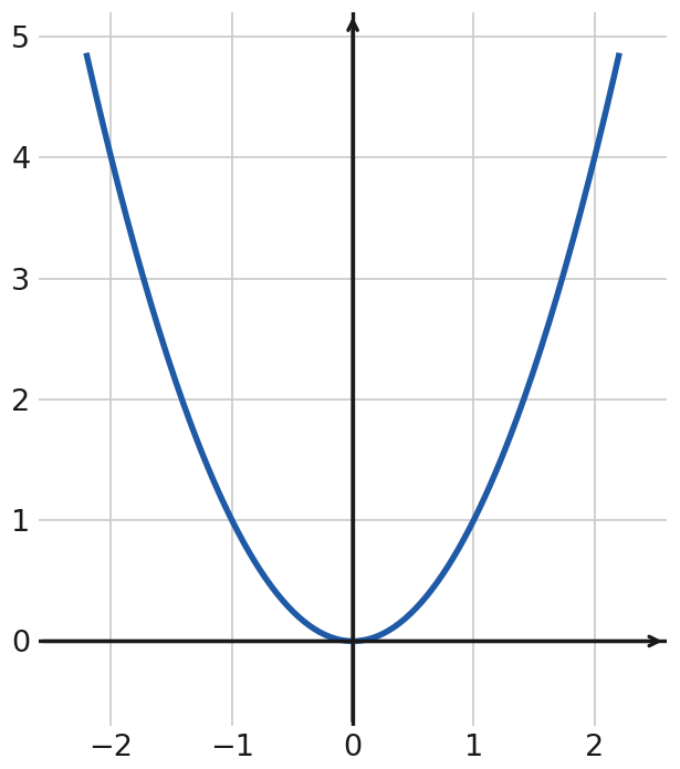


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Worked examples

EXAMPLE 1

Q Find the domain and range of $f(x) = x^2$



SOLUTION

Domain: any real number can be squared, so the domain is all real numbers.

Range: a square is never negative, so the outputs are 0 or greater.

So the domain is all real numbers and the range is y is greater than or equal to 0.

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EXAMPLE 2

Q Find the domain and range of $f(x) = \sqrt{x}$

SOLUTION

Domain: you cannot take the square root of a negative number in the real numbers, so x must be 0 or greater.

Range: a square root is never negative, so the outputs are 0 or greater.

So the domain is x is greater than or equal to 0 and the range is y is greater than or equal to 0.

Practice questions

1 Find the domain and range of $f(x) = x^2 + 1$.

- **A** Domain all real numbers, range y is greater than or equal to 1
- **B** Domain all real numbers, range y is greater than or equal to 0
- **C** Domain x is greater than or equal to 1, range all real numbers
- **D** Domain all real numbers, range y is less than or equal to 1

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2 **Find the domain and range of $f(x) = \sqrt{x-2}$.**

A. Domain x is greater than or equal to 0, range y is greater than or equal to 0

B. Domain x is greater than or equal to 2, range y is greater than or equal to 0

C. Domain all real numbers, range y is greater than or equal to 0

D. Domain x is greater than or equal to 2, range y is greater than or equal to 2

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Find the domain and range of $f(x) = -x^2$.

A. Domain all real numbers, range y is greater than or equal to 0

B. Domain x is greater than or equal to 0, range y is less than or equal to 0

C. Domain all real numbers, range y is less than or equal to 0

D. Domain all real numbers, range all real numbers

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4 **Find the domain and range of $f(x) = \sqrt{x+1}$.**

- **A** Domain x is greater than or equal to -1, range y is greater than or equal to 0
- **B** Domain x is greater than or equal to 1, range y is greater than or equal to 0
- **C** Domain x is greater than or equal to 0, range y is greater than or equal to 0
- **D** Domain all real numbers, range y is greater than or equal to 0

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Find the domain and range of $f(x) = 2x + 5$.

A Domain all real numbers, range y is greater than or equal to 5

B Domain x is greater than or equal to 0, range all real numbers

C Domain all real numbers, range all real numbers

D Domain all real numbers, range y is greater than or equal to 0

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Find the domain and range of $f(x) = x^2 - 4$.

A. Domain all real numbers, range y is greater than or equal to 4

B. Domain all real numbers, range y is greater than or equal to -4

C. Domain all real numbers, range y is less than or equal to -4

D. Domain x is greater than or equal to -4, range y is greater than or equal to 0

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7 **Find the domain and range of $f(x) = \sqrt{x} + 2$.**

A. Domain x is greater than or equal to 0, range y is greater than or equal to 0

B. Domain x is greater than or equal to 2, range y is greater than or equal to 0

C. Domain x is greater than or equal to 0, range y is greater than or equal to 2

D. Domain all real numbers, range y is greater than or equal to 2

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Find the domain and range of $f(x) = x^2 + 5$.

A. Domain all real numbers, range y is greater than or equal to 0

B. Domain x is greater than or equal to 5, range y is greater than or equal to 0

C. Domain all real numbers, range y is less than or equal to 5

D. Domain all real numbers, range y is greater than or equal to 5

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Find the domain and range of $f(x) = \sqrt{x-5}$.

A. Domain x is greater than or equal to 5, range y is greater than or equal to 0

B. Domain x is greater than or equal to 0, range y is greater than or equal to 0

C. Domain x is greater than or equal to 5, range y is greater than or equal to 5

D. Domain all real numbers, range y is greater than or equal to 0

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10 **Find the domain and range of $f(x) = -x^2 + 3$.**

A Domain all real numbers, range y is greater than or equal to 3

B Domain all real numbers, range y is less than or equal to 0

C Domain all real numbers, range y is less than or equal to 3

D Domain x is greater than or equal to 0, range y is less than or equal to 3

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ANSWER KEY

1. Domain all real numbers, range y is greater than or equal to 1

2. Domain x is greater than or equal to 2, range y is greater than or equal to 0

3. Domain all real numbers, range y is less than or equal to 0

4. Domain x is greater than or equal to -1, range y is greater than or equal to 0

5. Domain all real numbers, range all real numbers

6. Domain all real numbers, range y is greater than or equal to -4

7. Domain x is greater than or equal to 0, range y is greater than or equal to 2

8. Domain all real numbers, range y is greater than or equal to 5

9. Domain x is greater than or equal to 5, range y is greater than or equal to 0

10. Domain all real numbers, range y is less than or equal to 3

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