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الرياضيات
الصف الثاني عشر العام

mathematics

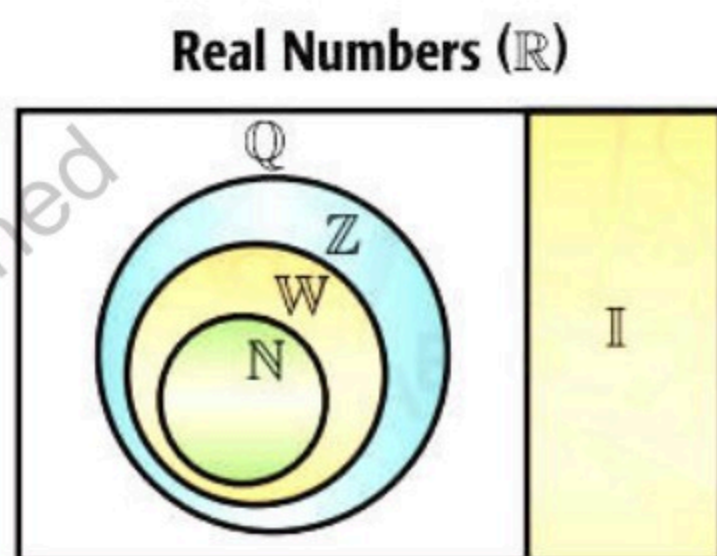
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2024 - 2025



Functions

Key Concept Real Numbers



Letter	Set	Examples
$\mathbb{Q}$	rationals	$0.125, -\frac{7}{8}, \frac{2}{3} = 0.666\dots$
$\mathbb{I}$	irrationals	$\sqrt{3} = 1.73205\dots$
$\mathbb{Z}$	integers	$-5, 17, -23, 8$
$\mathbb{W}$	wholes	$0, 1, 2, 3\dots$
$\mathbb{N}$	naturals	$1, 2, 3, 4\dots$

$$\{x \mid -3 \leq x \leq 16, x \in \mathbb{Z}\}$$

The set of numbers x such that...

x has the given properties...

and x is an element of the given set of numbers.

Use Set Builder Notation

Describe the set of numbers using set-builder notation.

 $\{1, 2, 3, 4, 5, \dots\}$ $x \leq -3$ all multiples of π $x < -19$ أو $x > 21$ $\{-4, -3, -2, -1, \dots\}$

Bounded Intervals		Unbounded Intervals	
Inequality	Interval Notation	Inequality	Interval Notation
$a \leq x \leq b$	$[a, b]$	$x \geq a$	$[a, \infty)$
$a < x < b$	(a, b)	$x \leq a$	$(-\infty, a]$
$a \leq x < b$	$[a, b)$	$x > a$	(a, ∞)
$a < x \leq b$	$(a, b]$	$x < a$	$(-\infty, a)$
		$-\infty < x < \infty$	$(-\infty, \infty)$



Use Interval Notation

Write each set of numbers using interval notation.

a. $-8 < x \leq 16$

b. $x < 11$

c. $x \leq -16$ or $x > 5$

d. $-4 \leq y < -1$

e. $a \geq -3$

f. $x > 9$ or $x < -2$

Key Concept Function**Words**A function f from set A to set B is a relation that assigns to each element x in set A *exactly one* element y in set B .**Symbols**The relation from set A to set B is a function.Set A is the domain.

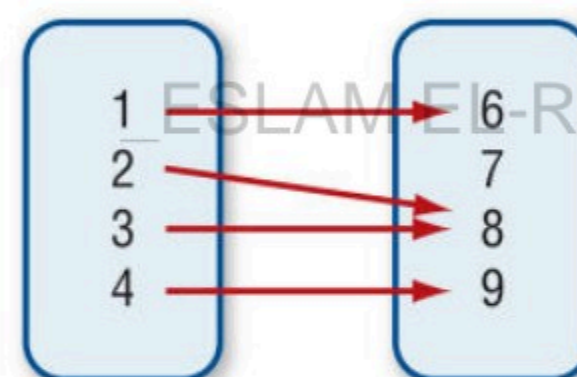
$D = \{1, 2, 3, 4\}$

Set B contains the range.

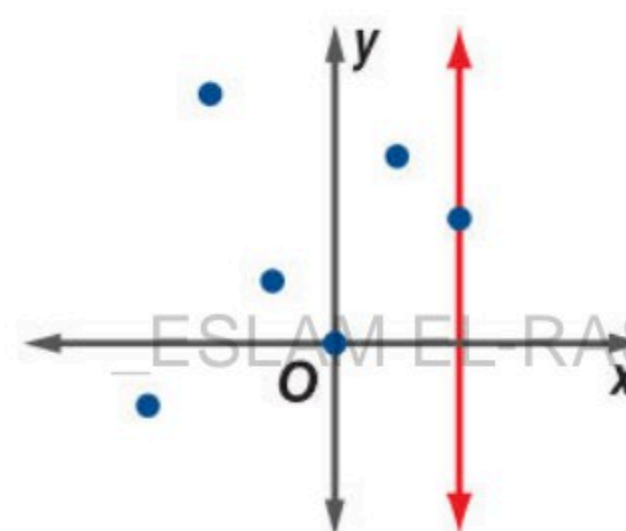
$R = \{6, 8, 9\}$

Set A

Set B

**Key Concept Vertical Line Test****Words**

A set of points in the coordinate plane is the graph of a function if each possible vertical line intersects the graph in at most one point.

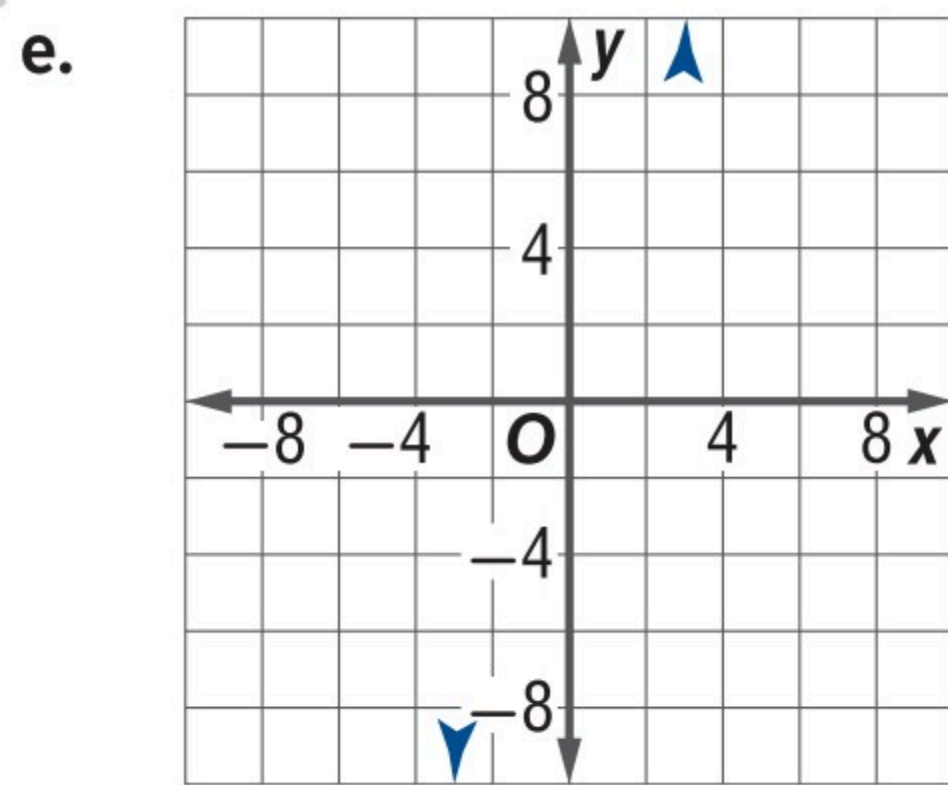
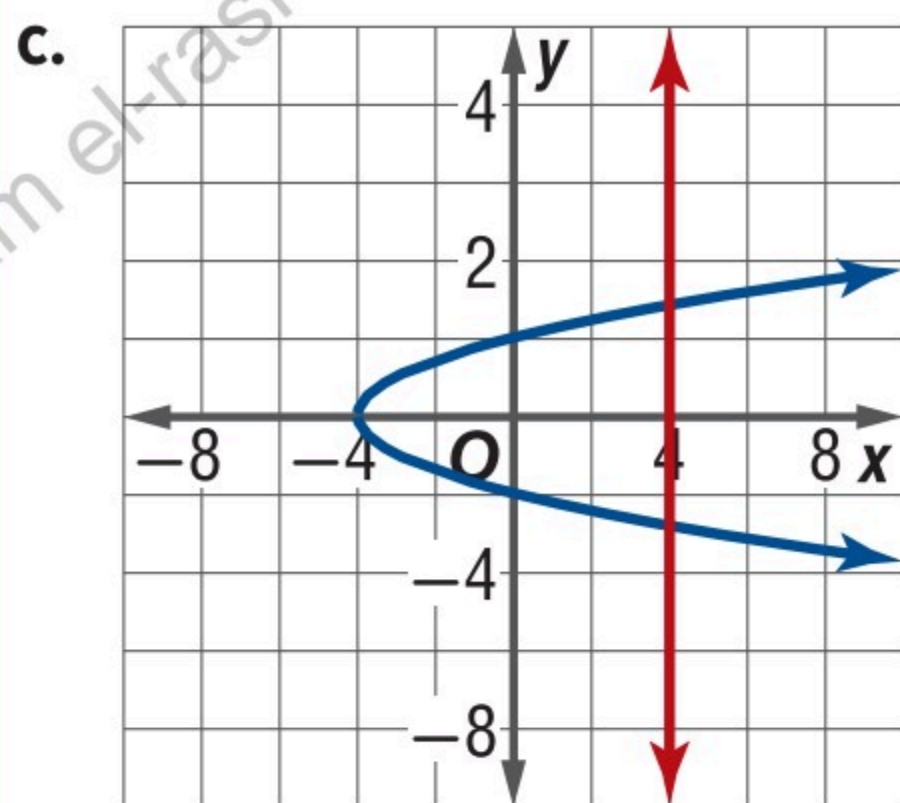
Model

Identify Relations that are Functions

Determine whether each relation represents y as a function of x .

a. The input value x is a student's ID number, and the output value y is that student's score on a physics exam.

b. The input value x is the area code, and the output value y is a phone number in that area code.



d.

x	y
-8	-5
-5	-4
0	-3
3	-2
6	-3

f.

x	y
-6	-7
2	3
5	8
5	9
9	22

g. $y^2 - 2x = 5$

h. $3y + 6x = 18$

Find Function Values

If $g(x) = x^2 + 8x - 24$, find each function value.

a. $g(7)$

b. $g(-2x)$

c. $g(5c + 2)$



Find Domains Algebraically

State the domain of each function.

a. $f(x) = \frac{2+x}{x^2-7x}$

b. $g(t) = \sqrt{t-5}$

c. $h(x) = \frac{1}{\sqrt{x^2-9}}$

d. $h(a) = \sqrt{a^2-4}$



$$f(x) = \frac{8x + 12}{x^2 + 5x + 4}$$

$$g(x) = \frac{x + 1}{x^2 - 3x - 40}$$

$$g(a) = \sqrt{1 + a^2}$$

$$h(x) = \sqrt{6 - x^2}$$

$$f(a) = \frac{5a}{\sqrt{4a - 1}}$$

$$g(x) = \frac{3}{\sqrt{x^2 - 16}}$$

Evaluate a Piecewise-Defined Function

$$h(x) = \begin{cases} 1.6x - 41.6 & , \quad 63 < x < 66 \\ 3x - 132 & , \quad 66 \leq x \leq 68 \\ 2x - 66 & , \quad x > 68 \end{cases}$$

$$h(63) =$$

$$h(67) =$$

$$h(90) =$$



Write each set of numbers in set-builder and interval notation, if possible.

1. $x > 50$

2. $x < -13$

3. $x \leq -4$

4. $\{-4, -3, -2, -1, \dots\}$

5. $8 < x < 99$

6. $-31 < x \leq 64$

7. $x < -19$ or $x > 21$

8. $x < 0$ or $x \geq 100$

9. $\{-0.25, 0, 0.25, 0.50, \dots\}$

10. $x \leq 61$ or $x \geq 67$

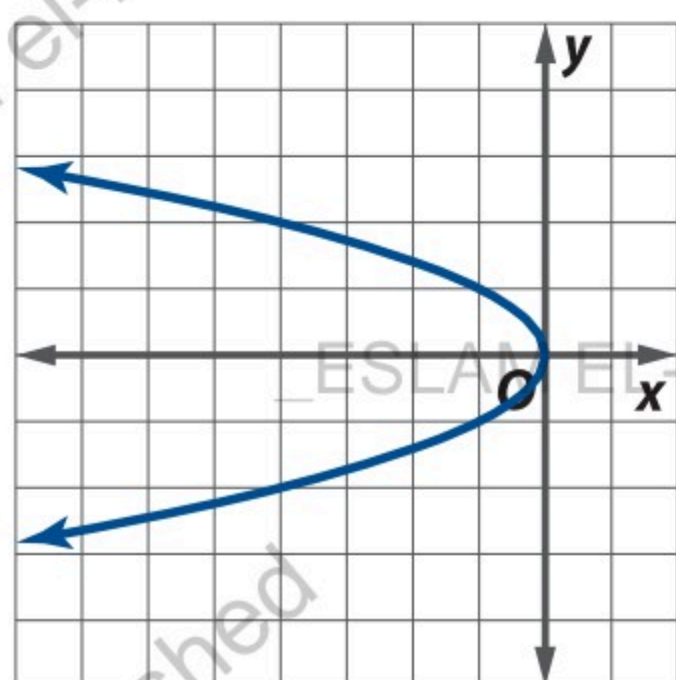
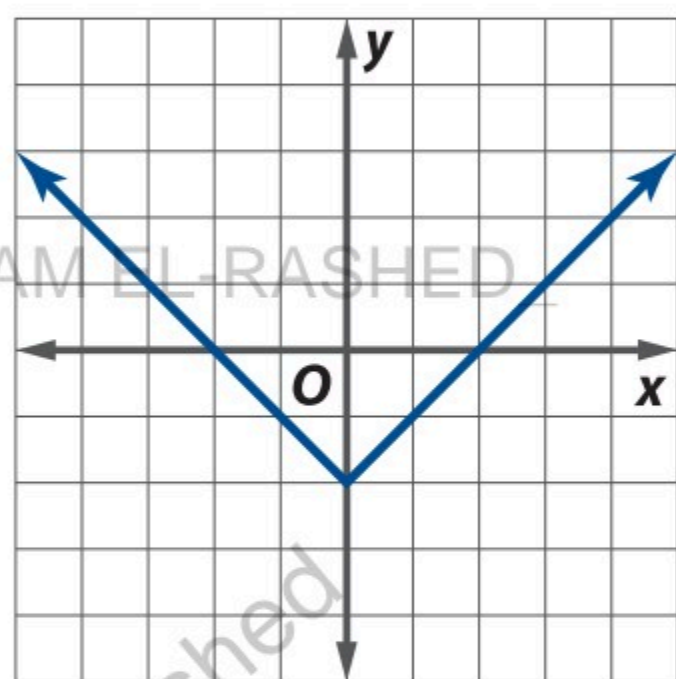
11. $x \leq -45$ or $x > 86$

12. all multiples of 8

13. all multiples of 5

14. $x \geq 32$

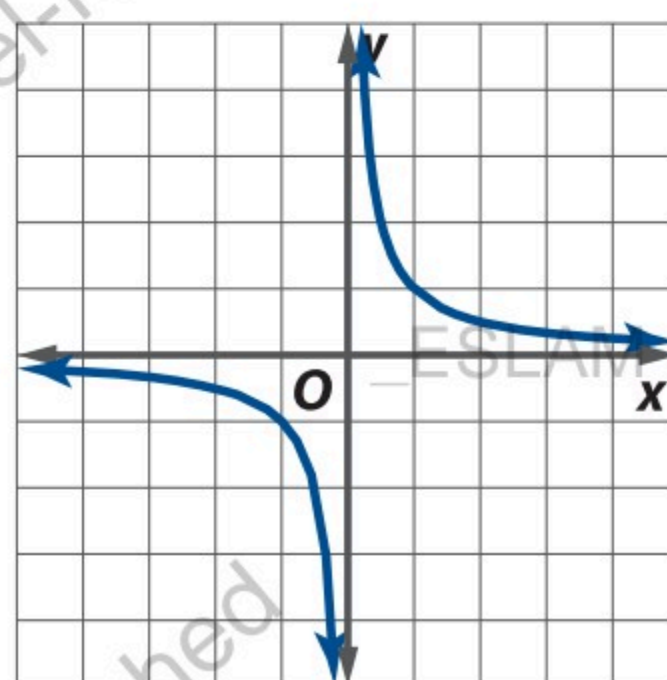
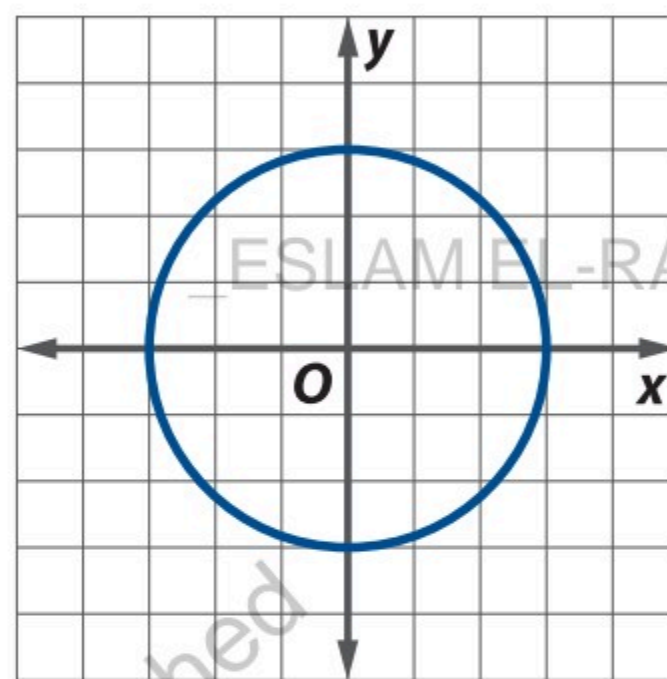
Determine whether each relation represents y as a function of x .



$$\frac{1}{x} = y$$

$$3y + 4x = 11$$

$$\sqrt{48y} = x$$



$$x^2 = y + 2$$

$$4y^2 + 18 = 96x$$

$$\frac{x}{y} = y - 6$$



Find each function value.

$$g(x) = 2x^2 + 18x - 14$$

a. $g(9)$

b. $g(3x)$

c. $g(1 + 5m)$

$$f(t) = \frac{4t + 11}{3t^2 + 5t + 1}$$

a. $f(-6)$

b. $f(4t)$

c. $f(3 - 2a)$

$$h(x) = 16 - \frac{12}{2x + 3}$$

a. $h(-3)$

b. $h(6x)$

c. $h(10 - 2c)$

$$h(y) = -3y^3 - 6y + 9$$

a. $h(4)$

b. $h(-2y)$

c. $h(5b + 3)$

$$g(x) = \frac{3x^3}{x^2 + x - 4}$$

a. $g(-2)$

b. $g(5x)$

c. $g(8 - 4b)$

$$f(x) = -7 + \frac{6x + 1}{x}$$

a. $f(5)$

b. $f(-8x)$

c. $f(6y + 4)$



Find $f(-5)$ and $f(12)$ for each piecewise function.

$$f(x) = \begin{cases} -4x + 3 & \text{if } x < 3 \\ -x^3 & \text{if } 3 \leq x \leq 8 \\ 3x^2 + 1 & \text{if } x > 8 \end{cases}$$

$$f(12) =$$

$$f(-5) =$$

$$f(x) = \begin{cases} -5x^2 & \text{if } x < -6 \\ x^2 + x + 1 & \text{if } -6 \leq x \leq 12 \\ 0.5x^3 - 4 & \text{if } x > 12 \end{cases}$$

$$f(12) =$$

$$f(-5) =$$

$$f(x) = \begin{cases} 2x^2 + 6x + 4 & \text{if } x < -4 \\ 6 - x^2 & \text{if } -4 \leq x < 12 \\ 14 & \text{if } x \geq 12 \end{cases}$$

$$f(12) =$$

$$f(-5) =$$