

Sec. 4.6 Formalizing Relations and Functions

Vocabulary:

- relation: a pairing of numbers in one set, the domain, with numbers in another set, the range.
- domain: the set of input (x -coordinate) values
- range: the set of output (y -coordinate) values
- vertical line test: if a vertical line passes through more than one point, the relation is NOT a function
- function notation:

$y = -3x + 1$ can be written as

$$f(x) = -3x + 1$$

" f of x " \rightarrow name, not a variable

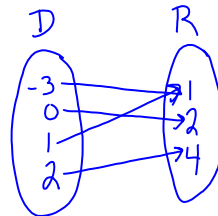
Substitute $x = 5$ into $y = -3x + 1$ \uparrow $y = -3(5) + 1$ $y = -15 + 1$ $y = -14$ $(5, -14)$	$f(x) = -3x + 1$ Find $f(5)$ $f(5) = -3(5) + 1$ $= -15 + 1$ $f(5) = -14$ $(5, -14)$
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Problem 1: Identify the domain and range of each relation. Represent the relation with a mapping diagram. Is the relation a function?

a. $\{(-3, 1), (0, 2), (1, 1), (2, 4)\}$

D: $\{-3, 0, 1, 2\}$

R: $\{1, 2, 4\}$

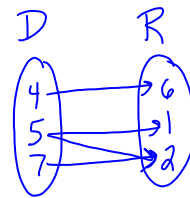


each input has exactly one output = function

b. $\{(4, 6), (5, 1), (7, 2), (5, 2)\}$

D: $\{4, 5, 7\}$

R: $\{1, 2, 6\}$

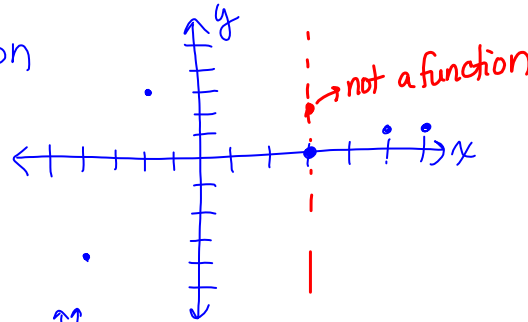


not a function
the input 5 has two outputs, 1 and 2

Problem 2: Is the relation a function? Use the vertical line test.

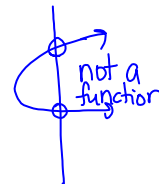
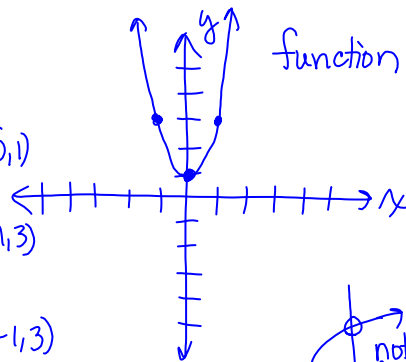
a. $\{(-4, -4), (-2, 3), (3, 0), (5, 1), (6, 1)\}$

function



b. $y = 2x^2 + 1$

x	$2x^2 + 1$	y
0	$2 \cdot 0^2 + 1$ $0 + 1$	1 (0, 1)
1	$2(1)^2 + 1$ $2 \cdot 1 + 1$ $2 + 1 = 3$	3 (1, 3)
-1	$2(-1)^2 + 1$ $2(1) + 1$ $2 + 1$	3 (-1, 3)



Problem 3:

The function $T(x) = 65x$ represents the number of words $T(x)$ that Rachel can type in x minutes. How many words can she type in 7 minutes?

$$T(x) = 65x$$

$$T(7) = 65(7)$$

$$T(7) = 455$$

$$x = 7$$

455 words

Problem 4: What is the range of $f(x) = 3x - 2$ with domain $\{1, 2, 3, 4\}$?

$$f(1) = 3(1) - 2$$

x	$3x - 2$	$f(x)$
1	$3(1) - 2$	1
2	$3(2) - 2 = 6 - 2$	4
3	$3(3) - 2 = 9 - 2$	7
4	$3(4) - 2 = 12 - 2$	10

Range: $\{1, 4, 7, 10\}$

Problem 5:

Lorena has 4 rolls of ribbon. Each roll can be used to make 30 party favors. The function $F(r) = 30r$ represents the number of favors that can be made with r rolls. What are a reasonable domain and range of the function? What is a graph of the function?

$$F(r) = 30r$$

$$F(0) = 30 \cdot 0 = 0$$

$$F(4) = 30 \cdot 4 = 120$$

$$0 \leq r \leq 4 \rightarrow \text{Domain}$$

$$0 \leq F(r) \leq 120 \rightarrow \text{Range}$$

