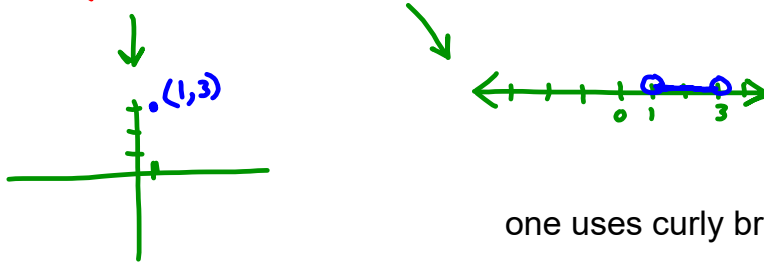


Section R. 1 (p. 7)

When is $(1, 3) \neq (1, 3)$?



one uses curly braces

when listing a finite many.

Recall,

$[1, 3]$ is a **closed interval**. It contains $\{1, 1.01, 1.7, 2.99, 3\}$

$$\{x : 1 \leq x \leq 3\}$$

include include

$(1, 3)$ is an **open interval**. It contains $\{1.01, 1.7, 2.99\}$

$$\{x : 1 < x < 3\}$$

exclude exclude

$[1, 3)$ is a **half-open interval**. It contains $\{1, 1.01, 1.7, 2.99\}$

$$\{x : 1 \leq x < 3\}$$

include exclude

Unbounded Intervals

$$x > 3 \quad (3, \infty)$$

$$x < 3 \quad (-\infty, 3)$$

$$x \geq 3 \quad [3, \infty)$$

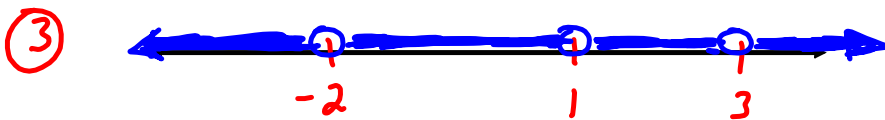
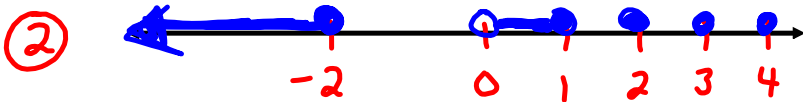
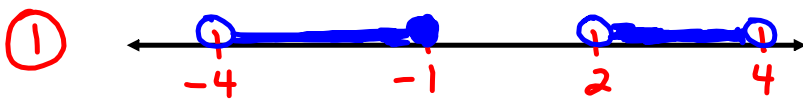
$$x \leq 3 \quad (-\infty, 3]$$

all real numbers $(-\infty, \infty) = \mathbb{R}$



Advanced Interval Notation $\cup = \text{"or"}$ Union

Write the following in interval notation



Write interval notation. Then graph the interval.

$$\{x \mid -2 < x < 2\}$$

$$\{x \mid 4 \leq x < 6\}$$

$$\{x \mid x \geq \sqrt{3}\}$$

$$\{x \mid -3 > x\}$$

1.2 Relations/Functions

Definition: A relation is a set of ordered pairs. The domain (inputs) is the set of x-coordinates. The range (outputs) is the set of y-coordinates.

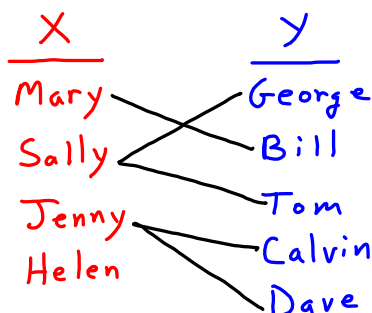
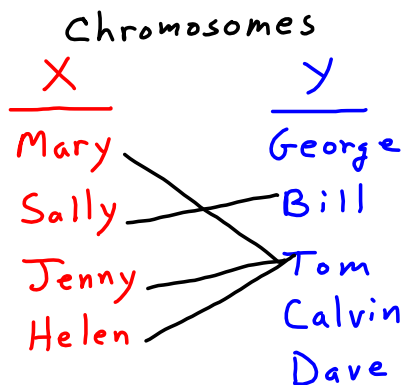
$$\text{Ex. } R = \{(2, 1), (3, 6), (-4, 6), (2, -3)\}$$

Definition: A function is a relation in which the x-coordinates do not repeat.

Is set R a function?

Is set $f: \{(1, 4), (-2, 5), (6, 4), (7, 4)\}$ a function?

Function = Old Fashion
Mormon Concept of Marriage



Is this a
function?

<p style="color: green; margin: 0;">Input</p> <p style="color: red; margin: 0;">Domain</p> <p style="color: blue; margin: 0;">US citizen</p>	<p style="color: red; margin: 0;">(Rule)</p> <p style="color: red; margin: 0;">Correspondence</p> <p style="color: blue; margin: 0;">Get a SSN</p>	<p style="color: red; margin: 0;">Range</p> <p style="color: blue; margin: 0;">Set of SSN Numbers</p>
<p>Function Yes or No</p>		

<p style="color: red; margin: 0;">Domain</p> <p style="color: blue; margin: 0;">FDTC student</p>	<p style="color: red; margin: 0;">(Rule)</p> <p style="color: red; margin: 0;">Correspondence</p> <p style="color: blue; margin: 0;">Class student is enrolled in</p>	<p style="color: red; margin: 0;">Range</p> <p style="color: blue; margin: 0;">Set of Classes</p>
<p>Function Yes or No</p>		

<p style="color: red; margin: 0;">Domain</p> <p style="color: blue; margin: 0;">A number</p>	<p style="color: red; margin: 0;">(Rule)</p> <p style="color: red; margin: 0;">Correspondence</p> <p style="color: blue; margin: 0;">Multiply it by $\underline{3}$</p>	<p style="color: red; margin: 0;">Range</p> <p style="color: blue; margin: 0;">Set of Numbers</p>
<p>Function Yes or No</p>		

<p style="color: red; margin: 0;">Domain</p> <p style="color: blue; margin: 0;">A number</p>	<p style="color: red; margin: 0;">(Rule)</p> <p style="color: red; margin: 0;">Correspondence</p> <p style="color: blue; margin: 0;">Find a square root</p>	<p style="color: red; margin: 0;">Range</p> <p style="color: blue; margin: 0;">Set of Numbers</p>
<p>Function Yes or No</p>		

<p style="color: red; margin: 0;">Domain</p> <p style="color: blue; margin: 0;">A number</p>	<p style="color: red; margin: 0;">(Rule)</p> <p style="color: red; margin: 0;">Correspondence</p> <p style="color: blue; margin: 0;">Find <u>the</u> principal square root</p>	<p style="color: red; margin: 0;">Range</p> <p style="color: blue; margin: 0;">Set of Numbers</p>
<p>Function Yes or No</p>		

A function is a set of ordered pairs, (x, y) , in which the x -coordinate does not repeat. The set of x -coordinates is called the domain. The set of y -coordinates is called the range.

If the x -coordinate repeats, it is not a function.

1.2

Exercise Set

In Exercises 1–14, determine whether the correspondence is a function.

1. $a \rightarrow w$
 $b \rightarrow y$
 $c \rightarrow z$

2. $m \rightarrow q$
 $n \rightarrow r$
 $o \rightarrow s$

3. $-6 \rightarrow 36$
 $-2 \rightarrow 4$
 $2 \rightarrow 4$

4. $-3 \rightarrow 2$
 $1 \rightarrow 4$
 $5 \rightarrow 6$
 $9 \rightarrow 8$

5. $m \rightarrow A$
 $n \rightarrow B$
 $r \rightarrow C$
 $s \rightarrow D$

6. $a \rightarrow r$
 $b \rightarrow s$
 $c \rightarrow t$
 $d \rightarrow s$

2) $\{(m, q), (n, r), (o, s)\}$

4) $\{(-3, 2), (1, 4), (5, 6), (9, 8)\}$

6) $\{(a, r), (b, s), (c, t), (d, s)\}$

Determine whether the relation is a function. Identify the domain and the range.

15. $\{(2, 10), (3, 15), (4, 20)\}$

16. $\{(3, 1), (5, 1), (7, 1)\}$

17. $\{(-7, 3), (-2, 1), (-2, 4), (0, 7)\}$

18. $\{(1, 3), (1, 5), (1, 7), (1, 9)\}$

19. $\{(-2, 1), (0, 1), (2, 1), (4, 1), (-3, 1)\}$

20. $\{(5, 0), (3, -1), (0, 0), (5, -1), (3, -2)\}$

21. Given that $g(x) = 3x^2 - 2x + 1$, find each of the following.

a) $g(0)$

b) $g(-1)$

c) $g(3)$

d) $g(-x)$

e) $g(1 - t)$

$$a) g(0) = 3(0)^2 - 2(0) + 1 = 0 - 0 + 1 = 1$$

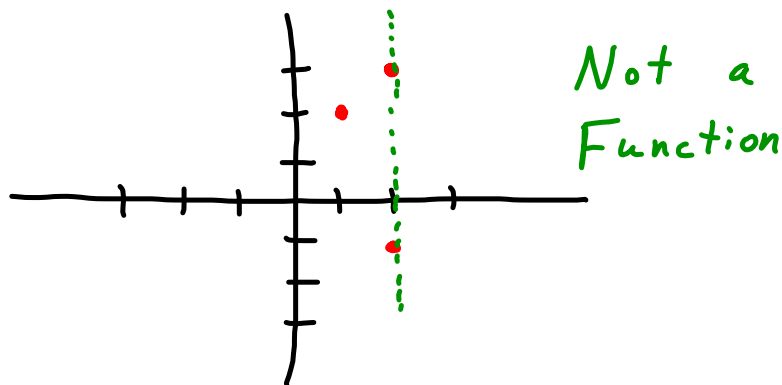
$$b) g(-1) = 3(-1)^2 - 2(-1) + 1 = 3 + 2 + 1 = 6$$

$$c) g(3) = 3(3)^2 - 2(3) + 1 = 27 - 6 + 1 = 22$$

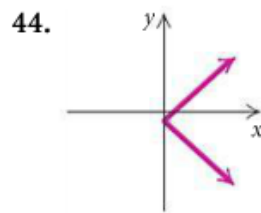
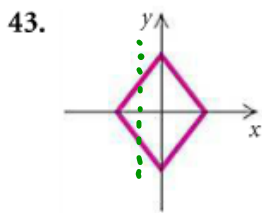
Vertical Line Test: Another way of saying the x-coordinate does not repeat is to say every vertical line goes through the plots of the relation no more than once; if that's the case, the relation is a function.

Contrapositive: If there exists a vertical line that goes through more than one point of the plots of the relation, then the relation is not a function.

Relation: $\{(1, 2), (2, 3), (2, -1)\}$

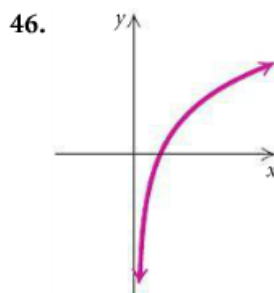
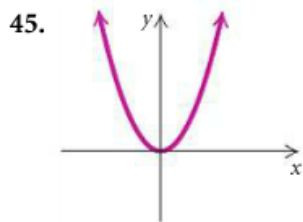


In Exercises 43–50, determine whether the graph is that of a function. An open circle indicates that the point does not belong to the graph.



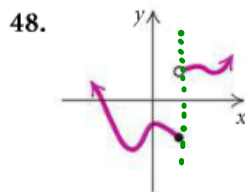
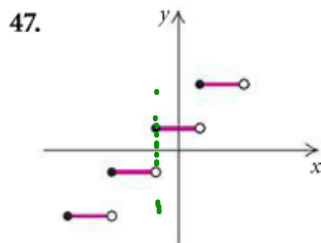
43)

44)



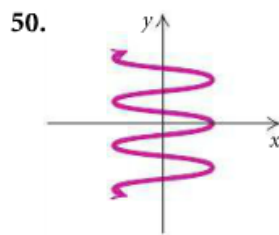
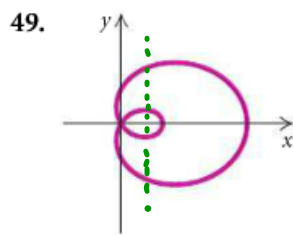
45)

46)



47)

48)



49)

50)

The **implied domain** is the set of all real numbers x so that $f(x)$ is also a real number.

(1) If x causes the denominator to be ZERO (0), then x is **not** in the domain.

(2) If x causes a negative number to occur underneath an even- root radical, then x is **not** in the domain.

If no value of x causes either (1) or (2) then the domain is the set of all real numbers.

Find the domain of the function. Do not use a graphing calculator.

51. $f(x) = 7x + 4$

52. $f(x) = |3x - 2|$

53. $f(x) = |6 - x|$

54. $f(x) = \frac{1}{x^4}$

55. $f(x) = 4 - \frac{2}{x}$

56. $f(x) = \frac{1}{5}x^2 - 5$

57. $f(x) = \frac{x + 5}{2 - x}$

58. $f(x) = \frac{8}{x + 4}$

59. $f(x) = \frac{1}{x^2 - 4x - 5}$

60. $f(x) = \frac{(x - 2)(x + 9)}{x^3}$

$$1) f(x) = \sqrt{x-4}$$

$$2) f(x) = \sqrt{4-x}$$

$$3) f(x) = \sqrt[3]{x-4}$$

$$4) f(x) = \frac{x+7}{\sqrt{2x+5}}$$

Graph the function with a graphing calculator. Then visually estimate the domain and the range.

75. $f(x) = |x|$

76. $f(x) = |x| - 2$

77. $f(x) = 3x - 2$

78. $f(x) = 5 - 3x$

79. $f(x) = \frac{1}{x - 3}$

80. $f(x) = \frac{1}{x + 1}$

81. $f(x) = (x - 1)^3 + 2$

82. $f(x) = (x - 2)^4 + 1$

83. $f(x) = \sqrt{7 - x}$

84. $f(x) = \sqrt{x + 8}$

85. $f(x) = -x^2 + 4x - 1$

86. $f(x) = 2x^2 - x^4 + 5$