INTRODUCTION TO FUNCTIONS

1 Let $f(x) = 2x + 3$. Calculate the following function values.

a $f(1)$ **b** $f(0)$ **c** $f(-2)$ **d** $f(4)$

6 Copy and complete the table of values for each function.

a $y = 2x + 1$

x	-1	0	1
y			

b $y = x^2 - 2x$

x	-1	0	1	2	3
y					

8 Given that $f(x) = x^2 - 3x + 5$, find the value of:

a $\frac{1}{2}\big(f(2) + f(3)\big)$ **b** $\frac{1}{4}\big(f(-1) + 2f(0) + f(1)\big)$

11 A restaurant offers a special deal to groups by charging a cover fee of \$50, then \$20 per person. Write down C, the total cost of the meal in dollars, as a function of x, the number of people in the group.

12 In each case explain why the function value cannot be found.

a $F(0)$, where $F(x) = \sqrt{x - 4}$. **b** $H(3)$, where $H(x) = \sqrt{1 - x^2}$.

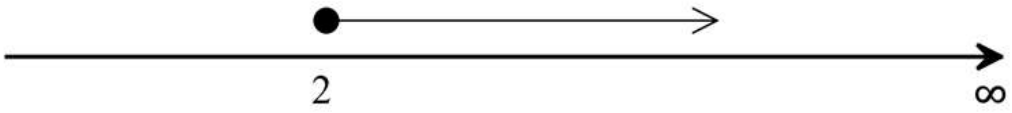
14 Find $g(a)$, $g(-a)$ and $g(a + 1)$ for each function.

a $g(x) = 2x - 4$ **b** $g(x) = 2 - x$ **c** $g(x) = x^2$ **d** $g(x) = \dfrac{1}{x - 1}$

SET NOTATION & INTERVAL NOTATION

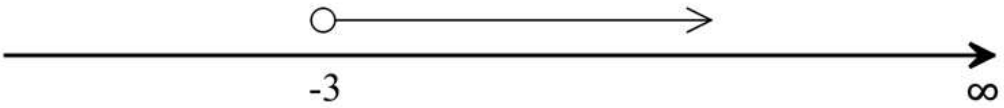
For the number line graphs below, describe the intervals in **set notation** and **interval notation.** The first one has been done for you.

1)



set notation: $x \geq 2$ interval notation: $x \in [2,+\infty)$

2)



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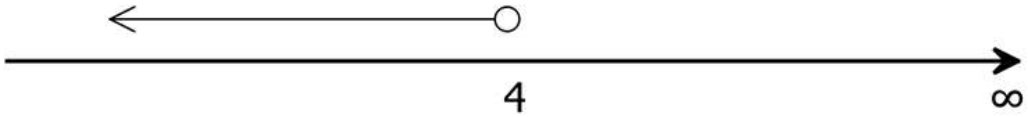

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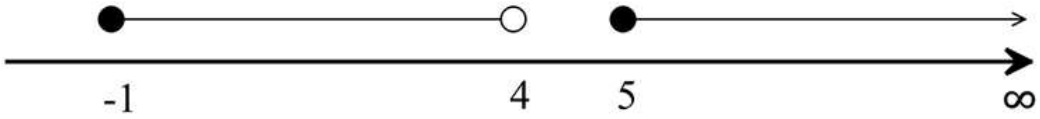

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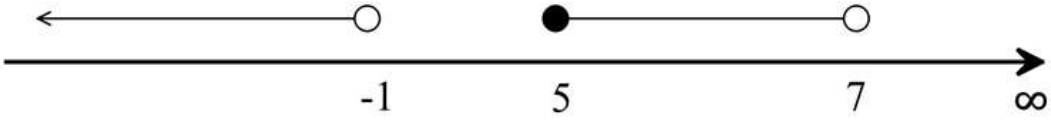


DOMAIN AND RANGE

The **domain** of a function $y = f(x)$ is the set of all x values for which $f(x)$ is defined.

The **range** of a function $y = f(x)$ is the set of all y values for which $f(x)$ is defined.

Interval notation

- $[a, b]$ means the interval is between a and b, including a and b
- (a, b) means the interval is between a and b, excluding a and b
- $[a, b)$ means the interval is between a and b, including a but excluding b
- $(a, b]$ means the interval is between a and b, excluding a but including b
- $(-\infty, \infty)$ means that the interval includes the set of all real numbers R

EXAMPLE 8

Find the domain and range of each function.

a $f(x) = x^2$ **b** $y = \sqrt{x - 1}$

Solution

a You can find the domain and range from the equation or the graph.

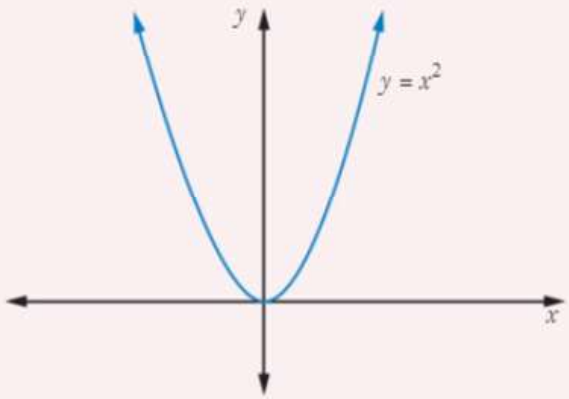
For $f(x) = x^2$, you can substitute any value for x. The y values will be 0 or positive.

So the domain is all real values of x and the range is all $y \geq 0$.

We can write this using interval notation:

Domain: $(-\infty, \infty)$

Range: $[0, \infty)$



b The function $y = \sqrt{x - 1}$ is only defined if $x - 1 \geq 0$ because we can only evaluate the square root of a positive number or 0.

For example, $x = 0$ gives $y = \sqrt{-1}$, which is undefined for real numbers.

So $x - 1 \geq 0$

$x \geq 1$

Domain: $[1, \infty)$

The value of $\sqrt{x - 1}$ is always positive or zero. So $y \geq 0$.

Range: $[0, \infty)$

Find the natural domain and range of each function.

	Natural domain	**Range**
$f(x) = x + 2$		
$f(x) = \sqrt{x}$		
$f(x) = x^2$		
$f(x) = 2 - x^2$		
$f(x) = \sqrt{x + 2}$		
$f(x) = \sqrt{3 - x}$		
$f(x) = \frac{1}{x}$		
$g(x) = 5 - x^2$		
$h(x) = \frac{1}{x-2}$		
$f(x) = \sqrt{5 + x}$		
$f(x) = \sqrt{16 - x^2}$		
$h(x) = \frac{1}{\sqrt{2x-3}}$		

DEFINITION OF A FUNCTION

A function is a relationship which associates **only one value of** y to a value of x.

1 State whether each set of ordered pairs represents a function.

a (0, 2), (1, 3), (2, 4), (3, 5), (4, 6)

b (1, 2), (2, 4), (3, 6), (4, 8), (5, 10)

c (2, 5), (2, −5), (3, 8), (4, −2), (5, 1)

d (3, 10), (4, 9), (5, 8), (6, 7), (7, 6)

2 Which table of values represents a function?

A:

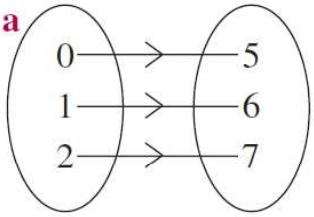
x	2	2	2	2	2
y	3	4	5	6	7

B:

x	0	1	2	3	4
y	5	5	5	5	5

3 State whether these mapping diagrams represent functions.

a



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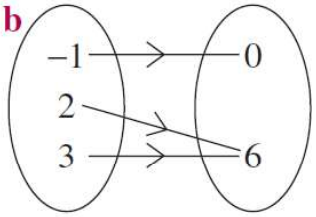

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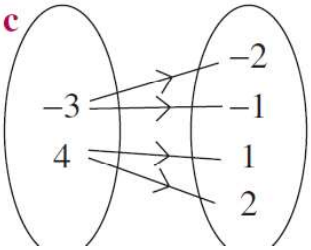

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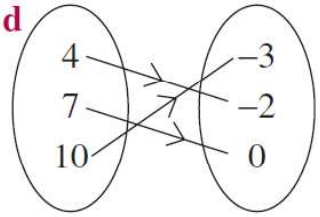
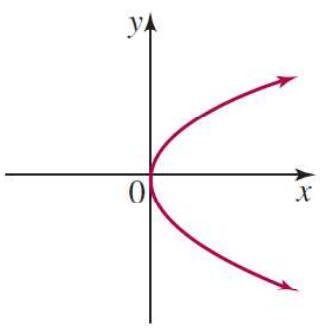


4 Use the vertical line test to determine whether each graph represents a function.

a



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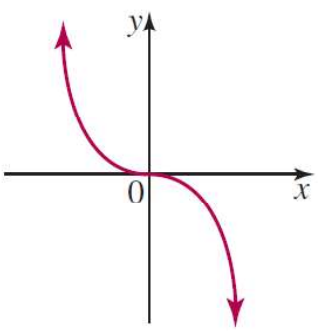

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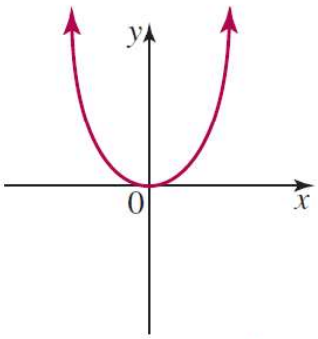

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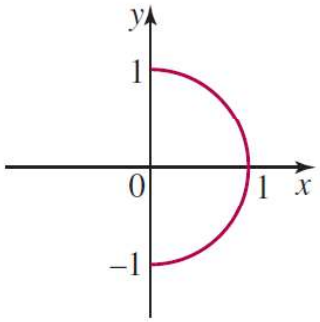

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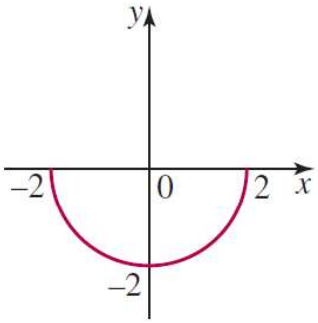

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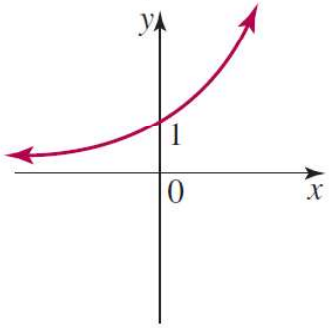

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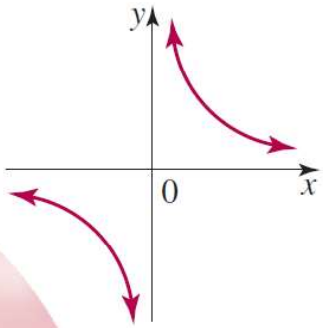

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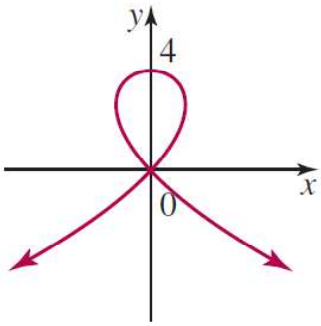

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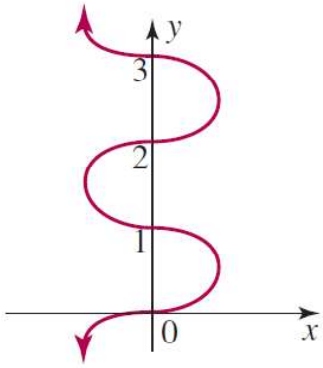

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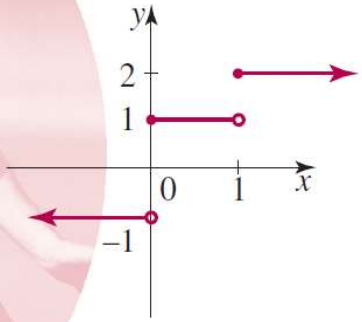

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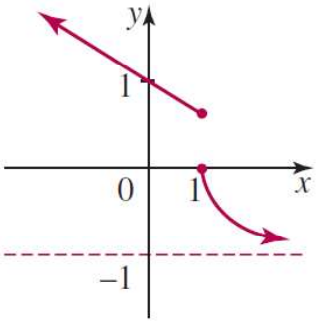

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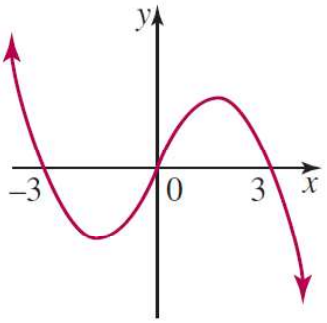


5 Explain the circumstances under which a straight line:

a must be a function **b** cannot be a function.

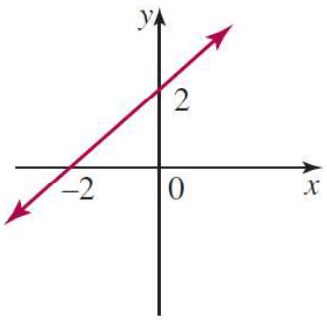
6 Determine whether each of the following equations represents a function.

a $y = 2x + 3$ **b** $x = 4$ **c** $y = -2$ **d** $y = x^2$

e $y = 1 - x^2$ **f** $x^2 + y^2 = 4$ **g** $y = \frac{1}{x}$ **h** $y = \sqrt{9 - x^2}$

7 Find the permissible x- and y-values for each of the following.

a



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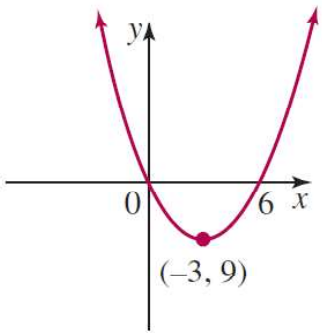

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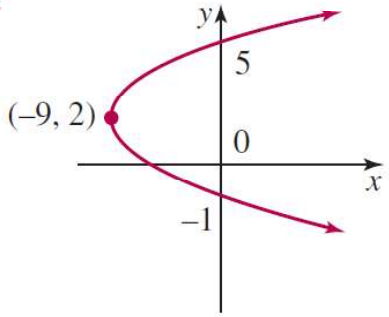

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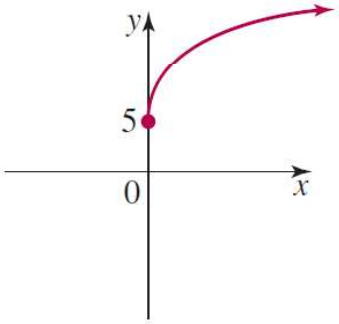

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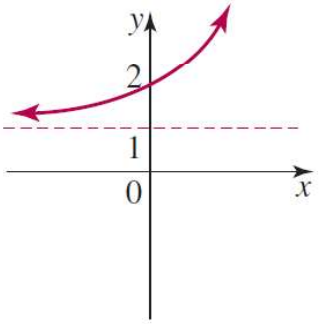

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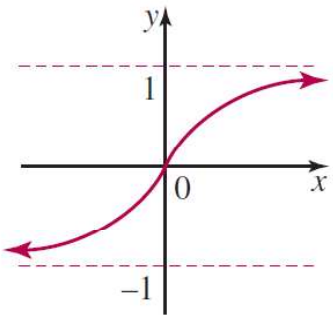
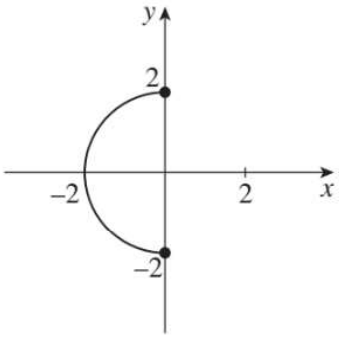


3 a Say whether each relation sketched below passes the vertical line test, and whether it passes the horizontal line test.

i



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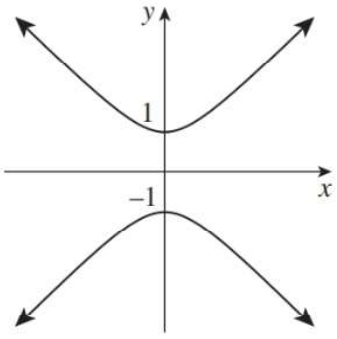

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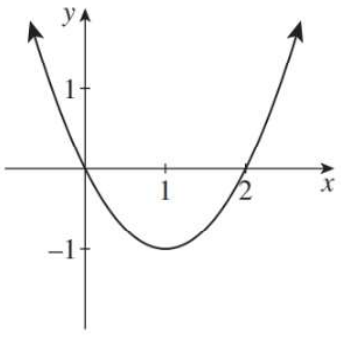

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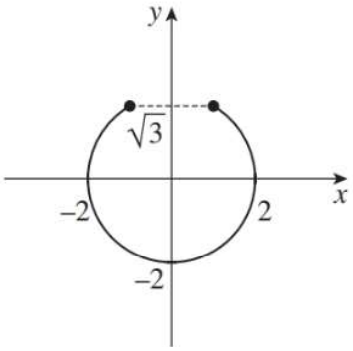

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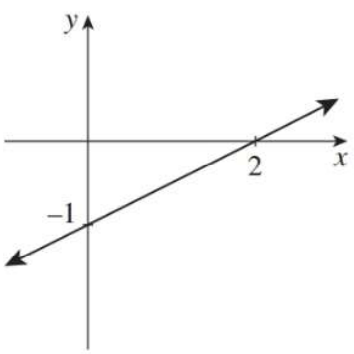

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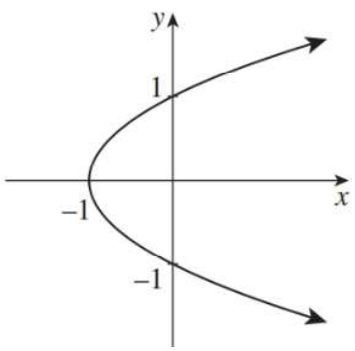
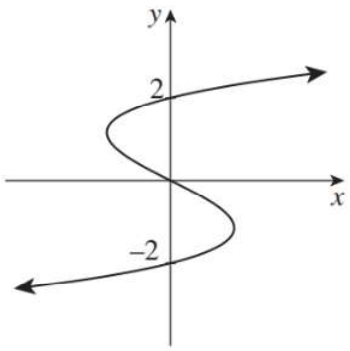


4 Classify each graph as one-to-one, many-to-one, one-to-many or many-to-many.

a



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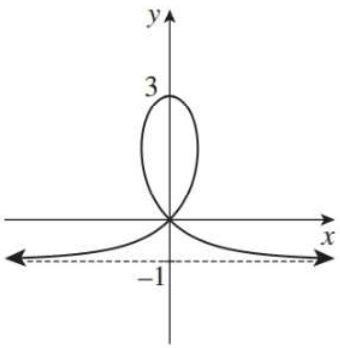

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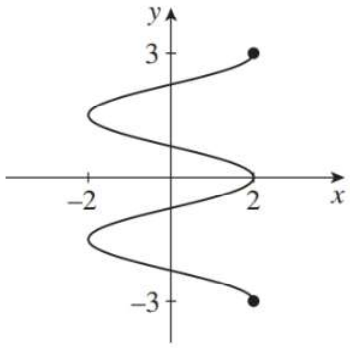

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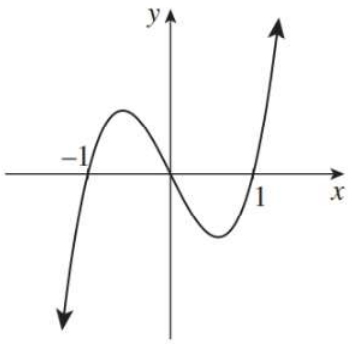

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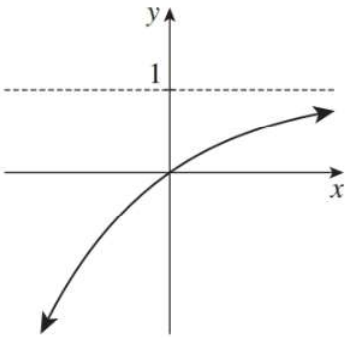

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