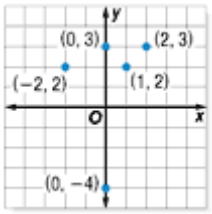
Lesson 2–1

Example 1 Domain and Range

State the domain and range of the relation shown in the graph. Is the relation a function?



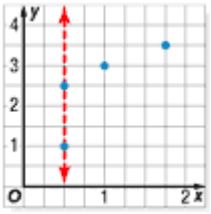
The relation is {(–2, 2), (0, –4), (0, 3), (1, 2), (2, 3)}.
The domain is {–2, 0, 1, 2}.
The range is {–4, 2, 3}.

The relation is not a function because 0 is paired with both –4 and 3 in the range.

Example 2 Vertical Line Test

Graph the values for the relation given in the table and determine whether it represents a function.

x	*y*
0.50	2.50
1.00	3.00
0.50	1.00
1.75	3.50



Use the vertical line test. Notice that there are two *y* values for the *x* value of 0.50. A vertical line intersects the graph in two points. Therefore, the graph does not represent a function.

Example 3 Graph is a Line

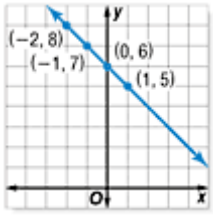
a. Graph the relation represented by $y = -x + 6$.

Make a table of values to find ordered pairs that satisfy the equation. Choose values for x and find the corresponding values for y. Then graph the ordered pairs.

x	y
–2	
–1	
0	
1	

→

x	y
–2	8
–1	7
0	6
1	5



b. Find the domain and range.

Since x can be any real number, there is an infinite number of ordered pairs that can be graphed. All of them lie on the line shown. Notice that every real number is the x–coordinate of some point on the line. Also, every real number is the y–coordinate of some point on the line. So the domain and range are both all real numbers.

c. Determine whether the relation is a function.

This graph passes the vertical line test. For each x–value, there is exactly one y–value, so the equation $y = -x + 6$ represents a function.

Example 4 Graph is a Curve

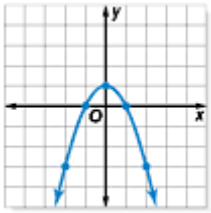
a. Graph the relation represented by $y = -x^2 + 1$.

Make a table. Choose values for x and find the corresponding values for y. Then sketch the graph, connecting the points with a smooth curve.

x	y
–2	
–1	
0	
1	
2	

→

x	y
–2	–3
–1	0
0	1
1	0
2	3



b. Find the domain and range.

Since x can be any real number, there is an infinite number of ordered pairs that can be graphed. But, only real numbers less than or equal to 1 are y–coordinates of points on the graph. So the domain is all real numbers and the range is $\{y \mid y \leq 1\}$.

c. Determine whether the relation is a function.

You can see by examining the graph that no vertical line will intersect the graph in more than one point. For each x value, there is exactly one y value, so the equation $y = -x^2 + 1$ represents a function.

Example 5 Evaluate a Function

Given $f(x) = x^3 - 5$, find each value.

a. $f(-2)$

$f(x) = x^3 - 5$	Original function
$f(-2) = (-2)^3 - 5$	Substitute.
$= -8 - 5$ or -13	Simplify.

b. $f(2a)$

$f(x) = x^3 - 5$	Original function
$f(2a) = (2a)^3 - 5$	Substitute.
$= 8a^3 - 5$	$(ab)^3 = a^3b^3$

c. Find $g(-1.7)$ if $g(x) = 2x^2 + 4x - 1$.

$g(x) = 2x^2 + 4x - 1$	Original function
$g(-1.7) = 2(-1.7)^2 + 4(-1.7) - 1$	**Estimate:** $g(-2) = 2(-2)^2 + 4(-2) - 1$ or -1
$= 5.78 - 6.8 - 1$	Multiply.
$= -2.02$	Compare with the estimate.