2.1 Represent Relations and Functions

Vocab:

Relation - a pairing of #'s
(ordered pairs; (x,y); a table...)

Domain - input of a relation
(x values)

Range - output of a relation
(y values)

Function - a relation where every input has only one output

EXAMPLE 1 **Represent relations**

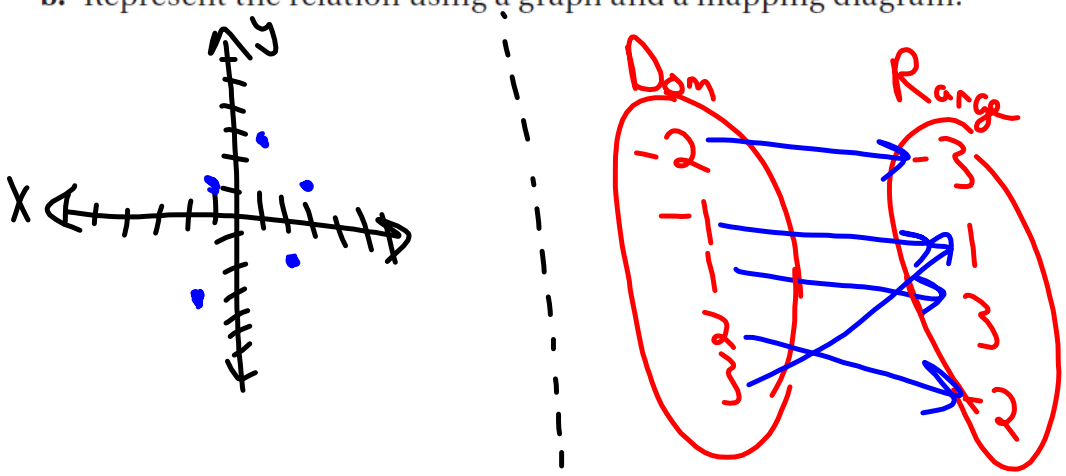
Consider the relation given by the ordered pairs (−2, −3), (−1, 1), (1, 3), (2, −2), and (3, 1).

a. Identify the domain and range.

dom: −2, −1, 1, 2, 3

range: −3, 1, 3, −2, 1

b. Represent the relation using a graph and a mapping diagram.



Consider the relation given by the ordered pairs $(-4, 3)$, $(-2, 1)$, $(0, 3)$, $(1, -2)$, and $(-2, -4)$.

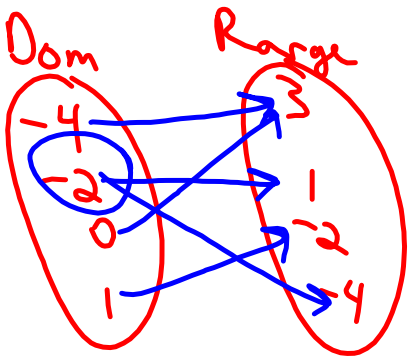
a. Identify the domain and range.

dom: $-4, -2, 0, 1$

range: $3, 1, -2, -4$

b. Represent the relation using a table and a mapping diagram.

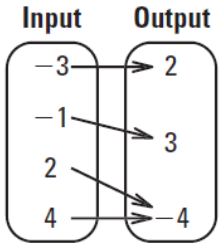
x	-4	-2	0	1	-2
y	3	1	3	-2	-4



EXAMPLE 2 **Identify functions**

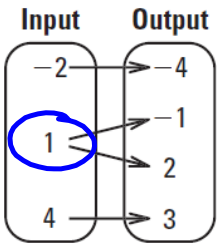
Tell whether the relation is a function. Explain.

a.



Func.

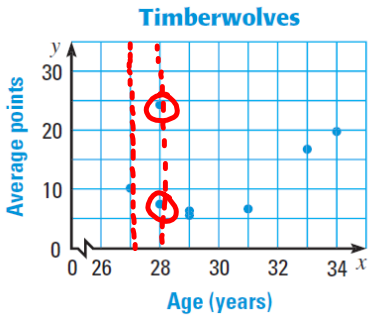
b.



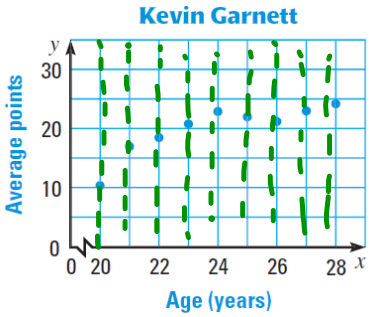
Not Func.

EXAMPLE 3 **Use the vertical line test**

Are the relations shown by the graphs functions? Use the vertical line test to explain.



Not a Func



Func.

EXAMPLE 4 Graph an equation in two variables

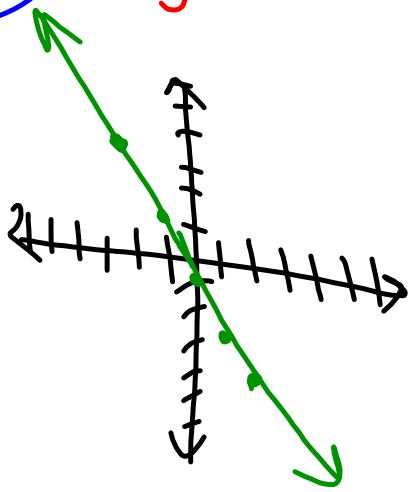
Graph the equation $y = -2x - 1$.

Construct a table of values.

x	−2	−1	0	1	2
y	3	1	−1	−3	−5

$y = -2(-2) - 1$
$= 4 - 1$
$y = 3$

$y = -2(-1) - 1$
$y = 1$



LINEAR FUNCTIONS The function $y = -2x - 1$ in Example 4 is a **linear function** because it can be written in the form $y = mx + b$ where m and b are constants. The graph of a linear function is a line. By renaming y as $f(x)$, you can write $y = mx + b$ using **function notation**.

$y = mx + b$ Linear function in *x*-*y* notation

$f(x) = mx + b$ Linear function in function notation

The notation $f(x)$ is read "the value of f at x," or simply "f of x," and identifies x as the independent variable. The domain consists of all values of x for which $f(x)$ is defined. The range consists of all values of $f(x)$ where x is in the domain of f.

$y = -2x - 1$

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

$f(2) = ?$

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

$-4 - 1$

$f(2) = -5$

EXAMPLE 5 **Classify and evaluate functions**

Tell whether the function is linear. Then evaluate the function when $x = -4$.

mx+b

a. $f(x) = -x^2 - 2x + 7$

not linear

$f(-4) = -(-4)^2 - 2(-4) + 7$

$-(16) - 2(-4) + 7$

$-16 + 8 + 7$

-1

$f(-4) = -1$

mx+b

b. $g(x) = 5x + 8$

linear

$g(-4) = 5(-4) + 8$

$= -20 + 8$

$g(-4) = -12$