3.6 Function Notation and Evaluating Functions

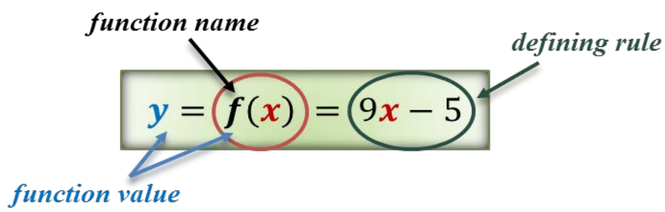
Consider function $\boldsymbol{f}$ given by the equation $y = 9x - 5$.

Function is a rule by which we assign a unique ***y***-value for every given ***x***-value. Function is often identified with the **graph** of it – the set of all ordered pairs $(\boldsymbol{x}, \boldsymbol{y})$ satisfying this rule.
For example, if $x = 1$, then $y = 9 \cdot 1 - 5 = 4$, so $(1,4)$ belongs to the graph of ***f***.
Similarly, if $x = 0$, then $y = 9 \cdot 0 - 5 = -5$, so $(0, -5)$ belongs to the graph of ***f***.

For a better clarity, we use notation $f(1) = 4$ (*read: "**f** of 1 is 4".*) This tells us that the function $\boldsymbol{f}$ assigns the value $y = 4$ to the input $x = 1$.

Similarly, the statement $f(0) = -5$ tells us that the value -5 is assigned to the input 0.
Or in other words, the function ***f*** attains the value -5 at 0.
Or, we could say that 0 is mapped by the function ***f*** onto -5.

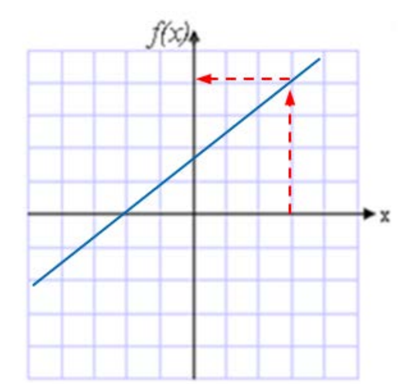
Since $f(x)$ carries more information than just y, we will often use $f(x)$ to denote the y-value assigned to the particular x.



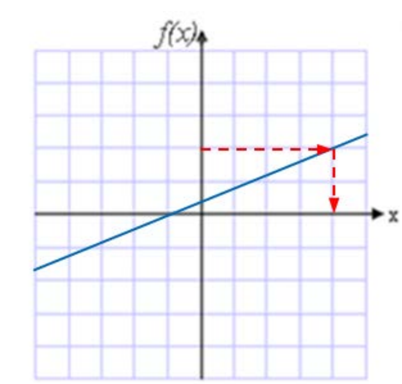
To distinguish functions, we may want to use various names, such as ***f***, ***g***, ***h***, or other letters or abbreviations like ***sin***, ***cos***, ***tan***.

Example 1: Refer to the given graph to find

a) $f(3)$



b) x-value such that $f(x) = 2$



Example 2:

To print t-shirts, there is a \$100 set-up fee, plus a \$12 charge per t-shirt. Let x represent the number of t-shirts printed and $f(x)$ represent the total charge.

a) Write a linear function that models this situation.

b) Find $f(125)$ and interpret your answer in the context of this problem.

c) For what value of x we can say that $f(x) = 1000$? Interpret your answer in the context of this problem.

Functions can be given in many different forms, for example: as a word description, equation, set of ordered pairs, graph, arrow diagram, etc. To evaluate a function at the given x-value means to find $f(x)$ that is assigned to x by this function.

Example 3:
For each function, find $f(-2)$.

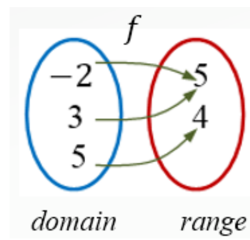
a) $f(x) = -x^2 + x - 1$

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

c)

x	$y = f(x)$
-3	6
-2	3
2	-1

d)



e) Function f triples the input and then subtracts it from 5.

Example 4: Given function $f(x) = 3x - 1$, evaluate

a) $f(-2)$

b) $f(-x)$

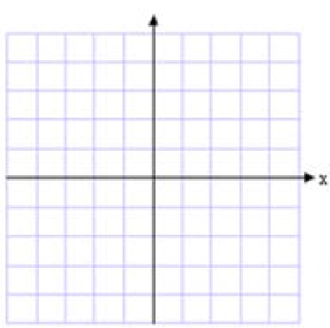
c) $f(a)$

d) $f(a+1)$

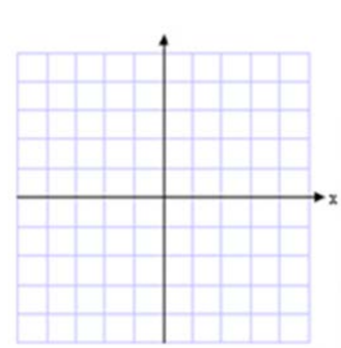
d) $f(a+1) - f(a)$

Example 5: Graph the given functions, then state their **domains** and **ranges**.

a) $g(x) = -\frac{2}{3}x + \frac{1}{2}$



b) $h(x) = -2$



Practice:

Given the function $f(x) = 1 - 2x$ and $g(x) = x^2 - 4x$, evaluate

a) $f(-1)$

b) $g(-1)$

c) $f(-2) - g(2)$

d) $f(a)$

e) $f(a + h)$

f) $f(a + h) - f(a)$

g) $g(-x) - g(x)$