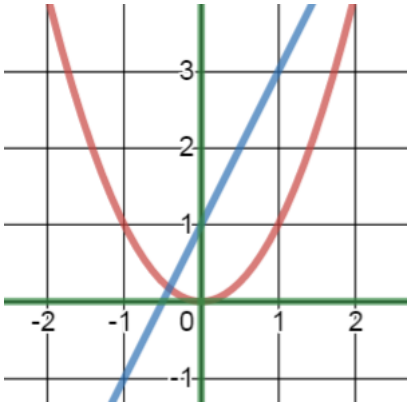
FUNCTION NOTATION

❑ INTRODUCTION

The notation "y = *whatever*" is a fine way to write a function, but it has a major flaw. Suppose we are talking about two functions in the same problem -- for example, the line $y = 2x + 1$ and the parabola $y = x^2$. I now ask you what the y-value is when $x = 1$. Is the answer 3 (from the line) or is the answer 1 (from the parabola)? It depends on which formula you chose.



If $x = 1$, what does y equal? It depends on which graph you're looking at.

❑ FUNCTION NOTATION

This is not an acceptable situation -- we'd never be able to communicate this way. This is why we use a new notation for functions: We give each function a <u>different name</u>, so that we can distinguish one from the other. So we can name our line and parabola functions something like

$$f(x) = 2x + 1 \quad \text{and} \quad g(x) = x^2$$

The f and the g are the names of the functions, and the x's in parentheses just make it clear which variable is the input. So, for example, in the function f, the input is x, and the output is $f(x)$ (that is, $2x + 1$).

Now, with this new notation, if I specify an input of $x = 1$, it's fair to ask you what $f(1)$ is, and you'll know for sure that it's 3, because I gave you both the input (the 1), and the function f. On the other hand, if I asked what $g(1)$ is, you'd be confident that it's 1. Get it??

EXAMPLE 1: **Given the three functions**

$$f(x) = 3x - 10$$

$$g(x) = x^2 + 1$$

$$h(x) = \frac{1}{x}$$

calculate each of the functional values:

A. $f(5) = 3(\mathbf{5}) - 10 = 15 - 10 = \mathbf{5}$

B. $g(5) = \mathbf{5}^2 + 1 = 25 + 1 = \mathbf{26}$

C. $h(5) = \frac{\mathbf{1}}{\mathbf{5}}$

D. $f(10) = 3(\mathbf{10}) - 10 = 30 - 10 = \mathbf{20}$

E. $g(\sqrt{7}) = (\sqrt{\mathbf{7}})^2 + 1 = 7 + 1 = \mathbf{8}$

F. $h(0) = \frac{1}{\mathbf{0}}$, which is **undefined**

Homework

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

$g(x) = 5 - x$

$h(x) = \sqrt[3]{x+1}$

Calculate:

a. $f(7)$	b. $g(7)$	c. $f(0)$	d. $g(0)$
e. $f(10)$	f. $g(10)$	g. $f(-5)$	h. $g(-5)$
i. $h(0)$	j. $h(-28)$	k. $h(-1)$	l. $f(-1)$

Solutions

1. a. $f(7) = \mathbf{7}^2 + 3(\mathbf{7}) = 49 + 21 = 70$ b. $g(7) = 5 - \mathbf{7} = -2$

c. 0 d. 5 e. 130 f. –5 g. 10 h. 10

i. 1 j. –3 k. 0 l. –2