

# Study Guide

Function Rules  
03/01/2012

## **Function Rules**

A function rule is an equation relating two variables. Variables are letters that represent unknown numbers, such as  $x$  and  $y$ .

**Example 2:** What function rule relates the values of the input variable,  $x$ , to the values of the output variable,  $y$ , in the table below?

$x$	$y$
1	-4
2	-3
3	-2
4	-1

Step 1: Determine what needs to be added to or subtracted from 1 to make it equal to -4. The solution is, "subtract 5," because  $1 - 5 = -4$ .

Step 2: Subtract 5 from each of the remaining  $x$ -values, and verify that they match the values listed for  $y$ .

Step 3: Write the function rule:  $y = x - 5$ .

Function rules can also be of the form  $y = ax + b$ , or  $y = ax$ . Rules of this form require the student to use multiplication, as well as addition and subtraction.

**Example 3:** What function rule relates the values of the input variable,  $x$ , to the values of the output variable,  $y$ , in the table below?

$x$	$y$
-4	-12
-2	-6
0	0
2	6
4	12

Step 1: First, the student should test the  $y$  values to see if they are multiples of the  $x$  values. If the function is of the form  $y = ax$ , then the student should be able to multiply all of the values in the  $x$  column by the same number, and arrive at the values in the  $y$  column. Multiplying -4 by 3 yields -12.

Step 2: Multiply the remaining  $x$  values by 3, and verify that they match the values listed for  $y$ .

Step 3: Write the function rule:  $y = 3x$ .

**Example 4:** What function rule relates the values of the input variable,  $x$ , to the values of the output variable,  $y$ , in the table below?

$x$	$y$
-4	-19
-2	-11
0	-3
2	5
4	13

Step 1: First, the student should test the  $y$  values to see if they are multiples of the  $x$  values. If the function is of the form  $y = ax$ , then the student should be able to multiply all of the values in the  $x$  column by the same number, and arrive at the values in the  $y$  column. If the student is unable to determine a single factor that yields the output values, he or she should continue to step 2. Since there isn't a factor that yields -19 when multiplied by -4, the student should continue to step 2.

Step 2: If there is an input value equal to 0, the student should always begin with this value. This line in the table will help the student to determine the value that is being added or subtracted since any factor multiplied by 0 equals zero. In this case, 3 is being subtracted from  $x$  because  $0 - 3 = -3$ . Therefore, the function must be of the form  $y = ax - 3$ .

Step 3: The student must now determine what value of  $a$  satisfies the function. Determining this value is made easier by performing the inverse of the operation found in step 2 on a chosen  $y$  value. Adding 3 to -19 yields -16. Since -4, (the corresponding  $x$  value) must be multiply by 4 in order to yield -16, the

factor 4 is the correct value for  $a$ .

Step 4: Multiply each input value by 4 and subtract 3 in order to verify that they match the values listed for  $y$ .

Step 5: Write the function rule:  $y = 4x - 3$ .