Name: KEY Date: ______________

FUNCTION NOTATION

Since functions are rules that convert **inputs** (typically x-values) into **outputs** (typically y-values), it makes sense that they must have their own **notation** to indicate what the what the rule is, what the input is, and what the output is. In the first exercise, your teacher will explain how to interpret this notation.

Exercise #1: For each of the following functions, find the outputs for the given inputs.

(a) $f(x)=3x+7$

$f(2)=3(2)+7=6+7=13$

$f(-3)=3(-3)+7=-9+7=-2$

(b) $g(x)=\frac{x-6}{2}$

$g(20)=\frac{20-6}{2}=\frac{14}{2}=7$

$g(0)=\frac{0-6}{2}=\frac{-6}{2}=-3$

(c) $h(x)=\sqrt{2x+1}$

$h(4)=\sqrt{2(4)+1}=\sqrt{9}=3$

$h(0)=\sqrt{2(0)+1}=\sqrt{1}=1$

Function notation can be very, very confusing because it really looks like multiplication due to the parentheses. But, there is no multiplication involved. The notation serves two purposes: (1) to tell us what the rule is and (2) to specify an output for a given input.

FUNCTION NOTATION

$$y = f\ (x)$$

Output → y Rule → f Input → x

Exercise #2: Given the function $f(x)=\frac{x}{3}+7$ do the following.

(a) Explain what the function rule does to convert the input into an output.

divides the input by 3 then adds 7 to the quotient

(b) Evaluate $f(6)$ and $f(-9)$.

$f(6)=\frac{6}{3}+7=2+7=9$

$f(-9)=\frac{-9}{3}+7=-3+7=4$

(c) Find the input for which $f(x)=13$. Show the work that leads to your answer.

$13=\frac{x}{3}+7$

$-7 \qquad -7$

$3\times 6=\frac{x}{\cancel{3}}\cancel{\times 3}$

$18=x$

(d) If $g(x)=2f(x)-1$ then what is $g(6)$? Show the work that leads to your answer.

$g(x)=2f(6)-1=2(9)-1=18-1=17$

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Recall that function rules commonly come in one of three forms: (1) equations (as in Exercise #1), (2) graphs, and (3) tables. The next few exercises will illustrate function notation with these three forms.

Exercise **#3:** Boiling water at 212 degrees Fahrenheit is left in a room that is at 65 degrees Fahrenheit and begins to cool. Temperature readings are taken each hour and are given in the table below. In this scenario, the temperature, T, is a function of the number of hours, h.

h (hours)	0	1	2	3	4	5	6	7	8
$T(h)$ ($^\circ F$)	212	141	104	85	76	70	68	66	65

(a) Evaluate $T(2)$ and $T(6)$.

$T(2) = 104$

$T(6) = 68$

(b) For what value of h is $T(h) = 76$?

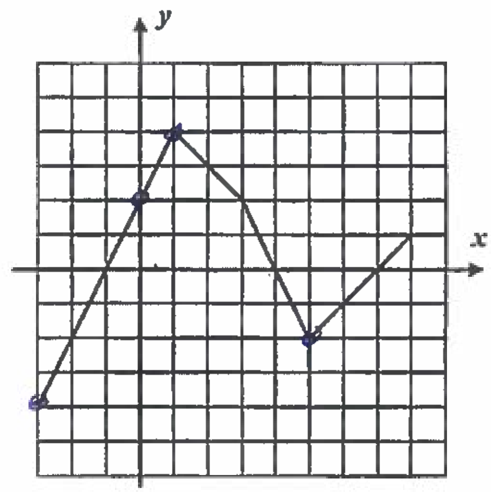
$h = 4$

(c) Between what two consecutive hours will $T(h) = 100$? Explain how you arrived at your answer.

between the 2nd and 3rd hours

$104 > 100 > 85$

Exercise **#3:** The function $y = f(x)$ is defined by the graph shown below. It is known as **piecewise linear** because it is made up of **straight line segments**. Answer the following questions based on this graph.



(a) Evaluate each of the following:

$f(1) =$ 4 $\qquad$ $f(5) =$ −2

$f(-3) =$ −4 $\qquad$ $f(0) =$ 2

(b) Solve each of the following for all values of the input, x, that make them true.

$f(x) = 0$ $\qquad$ $f(x) = 2$

−1, 4, 7 $\qquad$ 0, 3

(c) What is the largest output achieved by the function? At what x-value is it hit?

$4 = f(1)$