Algebra 3/4 Name ______________________________

HW: Function Notation

Function notation is a useful way in mathematics to identify different equations. We use it as a formal way to show whether to EVALUATE (find the value) of a function, or SOLVE (for a variable).

Part 1: Use the following functions to answer the problems below:

$f(x) = 2x - 3$	$g(x) = \frac{-12}{x}$	$m(x) = x^2$	$d(x) = 2(x - 3)$

Here we will practice EVALUATING.

Example 1: Find $f(-3)$.

$f(-3) = 2(-3) - 3$
$f(-3) = -6 - 3$
$f(-3) = -9$

Example 2: Find $d(6)$.

$d(6) = 2(6 - 3)$
$d(6) = 2(3)$
$d(6) = 6$

You Try:

1. Find $f(5)$. $f(5) = 2(5) - 3$
$= 10 - 3$
$f(3) = 7$

2. Find $g(-2)$. $g(-2) = \frac{-12}{-2}$
$g(-2) = 6$

3. Find $d(-5)$. $d(-5) = 2(-5-3)$
$= 2(-8)$
$d(-5) = -16$

4. Find $m(5)$. $m(5) = (5)^2$
$m(5) = 25$

5. Find $m(-5)$. $m(-5) = (-5)^2$
$m(-5) = 25$

6. Find $g(6)$. $g(6) = \frac{-12}{6}$
$g(6) = -2$

7. Find $f(-4)$. $f(-4) = 2(-4) - 3$
$f(-4) = -11$

8. Find $d(11)$. $d(11) = 2(11-3)$
$d(11) = 16$

9. Find $m(-11)$. $m(-11) = (-11)^2$
$m(-11) = 121$

Part 2: Now, we will practice SOLVING using the following functions to answer the problems below:

$f(x) = 2x - 3$	$g(x) = \frac{-12}{x}$	$d(x) = 2(x - 3)$

Example 1: Solve $f(x) = -11$

$2x - 3 = -11$
$2x = -8$
$x = -4$

Example 2: Solve $g(x) = 6$.

$\frac{-12}{x} = 6$
$-12 = 6x$
$-2 = x$

You Try:

1. Solve $d(x) = -18$
$\frac{2(x-3)}{2} = \frac{-18}{2}$
$x - 3 = -9$
$x = -6$

2. Solve $f(x) = 15$.
$2x - 3 = 15$
$+3 \quad +3$
$2x = 18$
$x = 9$

3. Solve $g(x) = 3$.
$\frac{-12}{x} = 3$
$-12 = 3x$
$-4 = x$

4. Solve $d(x) = -22$.
$2(x-3) = -22$
$x - 3 = -11$
$x = -8$

Part 3: More Challenging Mixed Practice:

5. If $m(x) = x^2$, solve $m(x) = 144$

$x^2 = 144$

$x = 12$ $\quad$ $x = -12$

6. If $h(x) = x^2 - 5x + 3$, find $h(-7)$.

$(-7)^2 - 5(-7) + 3$

$49 + 35 + 3$

$84 + 3 = 87$

7. If $p(x) = \frac{2x-5}{3}$, find $p(18)$.

$\frac{2(18)-5}{3} = \frac{36-5}{3} = \frac{31}{3}$

8. If $p(x) = \frac{2x-5}{3}$, solve $p(x) = -5$.

$\frac{2x-5}{3} = -5$

$2x - 5 = -15$

$2x = -10 \rightarrow x = -5$

Part 4: Finding & Checking Inverses:

$f(x) = 2x - 3$	$g(x) = \frac{-3x+2}{5}$	$h(x) = -3 + 2(x+1)^3$	$k(x) = 3\sqrt{x+4} - 2$

To find an inverse, you set the function equal to "y" and solve for "x" using SADMEP. Swap the "x" and "y" of the final result to write the inverse as a function. To check if two functions are inverses, look at a table of values to see that the domain and range are switched[1].

Example: Find the inverse of f(x), i.e. find $f^{-1}(x)$

$y = 2x - 3$

$y + 3 = 2x$

$\frac{y+3}{2} = x$

$f^{-1}(x) = \frac{x+3}{2}$

x	0	-3	1.5	-9
$f(x)$	-3	-9	0	-21
$f^{-1}(x)$	1.5	0	2.25	-3

Explain how the table supports the fact that the two functions are inverses

Because if $f(a) = b$ then $f^{-1}(b) = a$.

Examples: $f(0) = -3 \rightarrow f^{-1}(-3) = 0$

$f(-3) = -9 \rightarrow f^{-1}(-9) = -3$

Practice:

1. Find $g^{-1}(x)$ and check with a table

$\frac{-3x+2}{5} = y$

$-3x + 2 = 5y$

$-3x = 5y - 2$

$x = \frac{5y-2}{-3}$

$g^{-1}(x) = \frac{5x-2}{-3}$

x	g(x)	$g^{-1}(x)$
4	-2	-6
~~6~~	4	$-32/3$
-2	8/5	4

2. Find $h^{-1}(x)$ and check with a table

$y = -3 + 2(x+1)^3$

$y + 3 = 2(x+1)^3$

$\frac{y+3}{2} = (x+1)^3$

$\sqrt[3]{\frac{y+3}{2}} = x + 1$

$\sqrt[3]{\frac{y+3}{2}} - 1 = x$

$h^{-1}(x) = \sqrt[3]{\frac{x+3}{2}} - 1$

x	h(x)	$h^{-1}(x)$
0	-1	.145
-1	-3	0
-3	-19	-1
-19	-11667	-3

3. Find $k^{-1}(x)$ and check with a table

$y = 3\sqrt{x+4} - 2$

$y + 2 = 3\sqrt{x+4}$

$\frac{y+2}{3} = \sqrt{x+4}$

$\left(\frac{y+2}{3}\right)^2 = x + 4$

$\left(\frac{y+2}{3}\right)^2 - 4 = x$

$k^{-1}(x) = \left(\frac{x+2}{3}\right)^2 - 4$

x	k(x)	$k^{-1}(x)$
0	4	-3.5
4	6.49	0

[1] Later this unit we will use **composition of functions** to check more formally if two functions are inverses. If this worksheet is going easily for you, please ask Maurer about **function composition.**