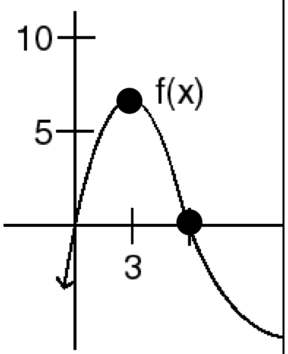
Investigating functions 2 Solutions NAME:

This worksheet will work on interpreting functional notation, determining function values, and determining the domain and range of functions.

1. For each equation or graph, find the desired value(s). Estimates will be accepted for parts *a* and *d*. Please simplify part *b*.

a.) Find $f(3)$ and $f(6)$.



This is asking for the y values when x is 3 and 6. So find the x values 3 and 6 on the graph. Then follow over to the y axis to read the y values off for those points.
f(3) = 7 (approx.)
f(6) = 0

b.) $f(x) = 4x^2 + 6x$
Find $f(x-2)$

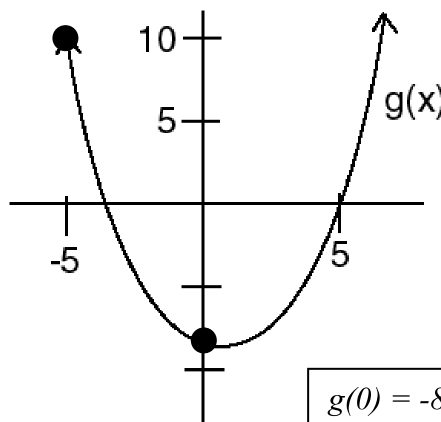
$$\begin{aligned} f(x-2) &= 4(x-2)^2 + 6(x-2) \\ &= 4(x^2 - 4x + 4) + 6(x-2) \\ &= 4x^2 - 16x + 16 + 6x - 12 \\ &= 4x^2 - 10x + 4 \end{aligned}$$

c.) $g(t) = (5t)^2 + 4t - 8$
Find $g(-3)$.

$$\begin{aligned} g(-3) &= (5 * -3)^2 + 4(-3) - 8 \\ &= (-15)^2 - 12 - 8 \\ &= 225 - 12 - 8 \\ &= 205 \end{aligned}$$

Notice the order of operations. "Five times t" is inside the parentheses so multiply before you square. Notice how this is different than $5t^2$.

d.) Find $g(0)$ and $g(-5)$.



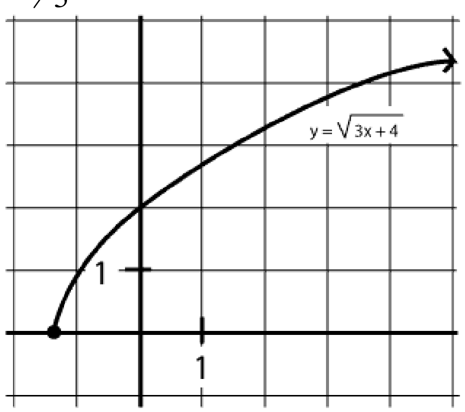
g(0) = -8
g(-5)=10

These problems work on understanding domain and range. Remember domain can be thought of as the *x* values that you can put into the function and that will yield acceptable *y* values. Range can be thought of as the *y* values you can possibly get out.

2a.) Consider the function $y = \sqrt{3x+4}$. Recall you cannot take the square root of a negative number (in the real number system). All *x* values that would result in the square root of a negative number would be excluded from the domain. Give one such *x* value that would be excluded from the domain.

There are lots of correct answers here. I see right away that if x were -20, y would be the square root of a negative number. So -20 is not in the domain.

b.) Graph this function on your grapher. Use the window [-2, 4] x [-1, 5] to match the graph paper given below. (Note: Make sure your graph looks like a curve and not a straight line. Although the calculator may not show it, the graph should hit the *x*-axis at $-\frac{4}{3}$.)



You would graph $y = \sqrt{\ }(3x+4)$ *on your grapher. Notice the parentheses around the 3x + 4.*

c.) Looking at the graph, what values of *x* are associated with the graph? In other words, what values of *x* will work in the function $y = \sqrt{3x+4}$? This is the domain.

Going from left to right, look for x values that give a point on the graph. The left-most x value is $-\frac{4}{3}$ *. All x values to the right of that also have corresponding points on the graph. So the domain is all real numbers greater than or equal to* $-\frac{4}{3}$ *. In interval notation, this is* $[-1.33, \infty)$ *. I usually revert to decimal form when I write the intervals.*

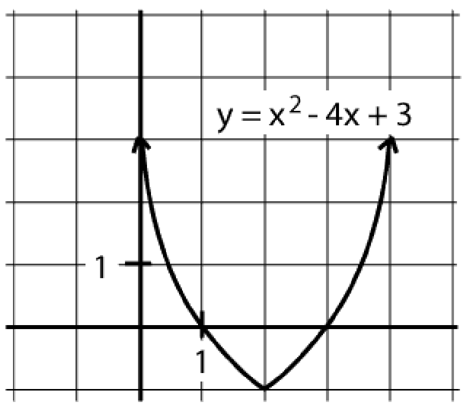
d.) Looking at the graph, what values of *y* are associated with the graph? In other words, what values could we get out for *y*? This is the range.

Going from bottom to top, look for y values that correspond to points on the graph. There are no points on the graph whose y values are negative. The y values that show up on the graph are positive numbers and zero. So the range is $y \geq 0$ *.*

3a.) Consider $y = x^2 - 4x + 3$. Are there any x values that would not work in the function? (Try to think of any x values that would force us to square root negative numbers or divide by zero. These values, if they exist, would be excluded from the domain.)

There are no x values that would not work. The domain is all real numbers or $(-\infty, \infty)$.

b.) Graph the function $y = x^2 - 4x + 3$. Use the window [-2, 5] x [-1, 5] to match the graph paper given below. (Note: The vertex (where it turns) is at (2, -1). Graph it accurately.)



c.) Looking at the graph, what values of x are associated with the graph? In other words, what values of x will work in the function $y = x^2 - 4x + 3$? This is the domain.

All x values will work. Notice the graph, since it continues on both the left and right sides forever, encompasses all real numbers in its domain.

d.) Looking at the graph, what values of y are associated with the graph? In other words, what values could we get out for y? This is the range.

Notice the lowest y value on the graph is -1. The graph never goes below this number. Every number (y values) greater than -1 corresponds to some point on the graph. So the range is $y \geq -1$.