More on Function Notation and the Difference Quotient

Remember that in using Function Notation you can evaluate a function at a given value and thus find a coordinate point on the graph (x, y) (where x is the input and y is the output).

Example

Given $f(x) = 2x^2 + 3x - 1$ find $f(-2), f(3), f(a), \frac{f(x+h)-f(x)}{h}$. Remember that in finding the value of the function that you are inputting or substituting or plugging in a value for every x-value.

$$f(-2) = 2(-2)^2 + 3(-2) - 1$$
$$f(-2) = 1$$
$$f(3) = 2(3)^2 + 3(3) - 1$$
$$f(3) = 26$$
$$f(a) = 2a^2 + 3a - 1$$

Now to find $\frac{f(x+h)-f(x)}{h}$ we are going to break it down into simple steps that lead to the final result. Remember that this expression is called the Difference Quotient. It is used heavily in Calculus to find a derivative. It is important that you learn how to do find this expression so that when you are in calculus the rest of the difference quotient is easy to work with.

$$f(x+h) = 2(x+h)^2 + 3(x+h) - 1$$

Remember that you are substituting the input value in for each x-value. Thus the input is $x + h$ and so every x is replaced with $x + h$.

$$f(x+h) = 2(x^2 + 2xh + h^2) + 3x + 3h - 1$$
$$f(x+h) = 2x^2 + 4xh + 2h^2 + 3x + 3h - 1$$
$$f(x+h) - f(x) = 2x^2 + 4xh + 2h^2 + 3x + 3h - 1 - (2x^2 + 3x - 1)$$
$$f(x+h) - f(x) = 2x^2 + 4xh + 2h^2 + 3x + 3h - 1 - 2x^2 - 3x + 1$$
$$f(x+h) - f(x) = 4xh + 2h^2 + 3h$$

Notice that each term has an h value. If you have any terms that do not have an h value then you have not simplified correctly—most likely you forgot to distribute the negative.

$$\frac{f(x+h) - f(x)}{h} = \frac{4xh + 2h^2 + 3h}{h}$$
$$\frac{f(x+h) - f(x)}{h} = \frac{h(4x + 2h + 3)}{h}$$
$$\frac{f(x+h) - f(x)}{h} = 4x + 2h + 3$$

Please remember that the labels are very important. You need to make sure that you have an equation for each evaluation.