We have seen how to transform an entire graph, and transforming a point is no different. We will once again be given the transformation of some original function, however rather than making changes to the entire graph we will simply need to find the new location of an original point. All the same transformations that have already been covered will be used.

Keep in mind that the ordered pairs for a function are expressed as $(x, f(x))$ or $(\text{input}, \text{output})$.

<u>Example 1:</u> If the point P is on the graph of a function $y = f(x)$, find the corresponding point on the graphs of the given functions. **<u>Keep in mind order of operation.</u>**

a. $P(0, 5)$; $y = f(x + 2) - 1$ b. $P(3, -1)$; $y = 2f(x) + 4$

Changes **IN**side the parentheses change the **IN**puts and we do the **IN**verse

Changes **OUT**side the parentheses change the **OUT**puts and we do exactly what we see

$(\text{input} - 2, \text{output} - 1)$

$(0 - 2, 5 - 1)$

$\mathbf{(-2, 4)}$

$(\text{input}, 2(\text{output}) + 4)$

$(3, 2(-1) + 4)$

$\mathbf{(3, 2)}$

c. $P(-1,-2); y = 2f(x-4)+1$ d. $P(-5,4); y = \frac{1}{2}f(x+3)+3$

e. $P(3,-9);\quad y = -3f\left(\frac{1}{4}x\right)+1$ f. $P(-2,-6); y = \frac{1}{3}f(-4x)-5$

g. $P(3,0); y = \frac{1}{4}f(x+6)-2$ h. $P(2,1); y = 3f(2x)-5$

Once again, keep in mind that the ordered pairs for a function are expressed as $(x, f(x))$ or $(\text{input}, \text{output})$. Changes to the inputs of a function are made to the x-coordinate of an ordered pair, and changes to the outputs of a function are made to the y-coordinate of an ordered pair.

Answers to Examples:

1a. $(-2,4)$; *1b.* $(3,2)$; *1c.* $(3,-3)$; *1d.* $(-8,5)$;

1e. $(12,28)$; *1f.* $\left(\frac{1}{2},-7\right)$; *1g.* $(-3,-2)$; *1h.* $(1,-2)$;