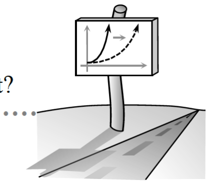
CW#____ Name:________________________

5.1.2 Can two transformations be equivalent?

Stretching Exponential Functions



Simplify the following expressions using properties of exponents.

1. $(x^3)(x^4)$

2. $\frac{a^9}{a^6}$

3. $(y^2)^5$

4. $\left[(z^2)^3\right]^2$

5. $\left[(z^2)(x^4)\right]^3$

6. $\left[(y^{-2})(y^3)\right]^0$

7. $\left[(a^{-3})(a^5)\right]^3$

8. $\left(\frac{x^4}{x}\right)^2$

9. $(x^{-3})(x^3)+(y^4)(y^{-4})$

10. $(2x)^3(3x)^2$

11. $\frac{(5x)^2(2x)^2}{5x}$

12. $\left[\frac{(3x)^3(2x)^2}{4x}\right]^2$

#12 Can two different transformations give the same result? To explore this, consider the exponential function $k(x) = 5(2)^{3(x-2)}$. Can this equation also be written in the form $y = a\cdot b^x$? Work with your team to determine if it is possible to rewrite $k(x)$ using only a vertical stretch. If so, justify your decision. If not, explain completely why it does not work.

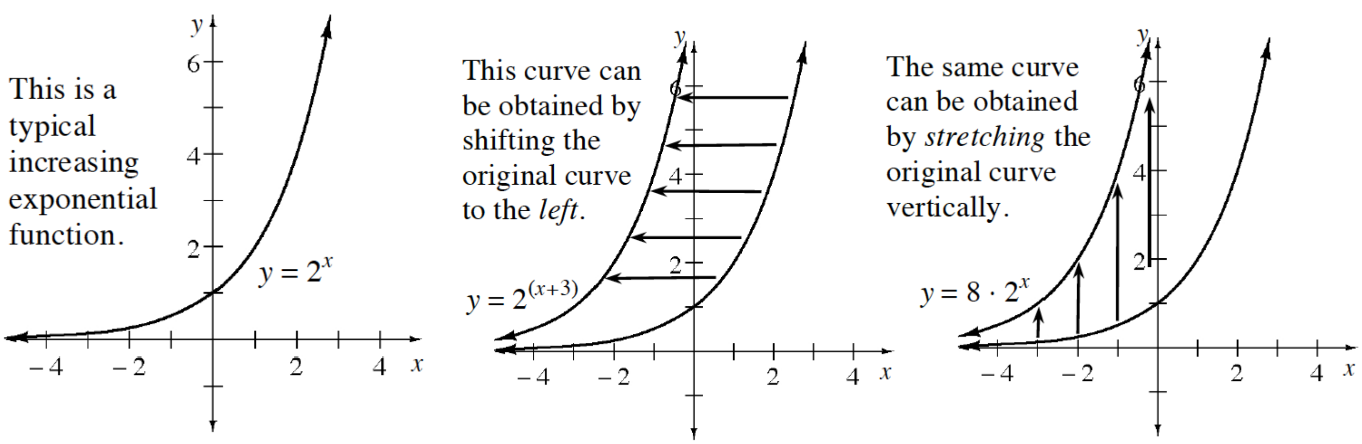
#14 Let $f(x) = 3 \cdot 4^x$. Use the properties of exponents to show that each of the following equations is true.

a. $f(x + 2) = 16\, f(x)$

b. $f(x - 1) = \frac{1}{4}\, f(x)$

#15 As you saw in the previous problems, for an exponential function, a *horizontal shift* is equivalent to a *vertical stretch*. To visualize this, look at the graphs below.

a. Discuss these graphs with your team to make sure everyone understands that the graphs demonstrate that for an exponential function, a horizontal shift is equivalent to a vertical stretch.



b. Graphs help demonstrate why, but they do not prove, that for any exponential function, every *horizontal shift* is equivalent to a *vertical stretch*. Algebraically prove that the two forms, $y = b^{x+h}$ and $y = a \cdot b^x$, are equivalent. That is, a *horizontal shift* is equivalent to a *vertical stretch* for exponential functions.