Transformations – Exponential   Name **Key**

Transformed Exponential Function: $f(x) = ab^{x-h} + k$

Parent Function	Exponential $f(x) = 2^x$		
Shift up $f(x) + k$	$f(x) = 2^x + K$	ex) $f(x) = 2^x + 2$	Up 2
Shift down $f(x) - k$	$f(x) = 2^x - K$	ex) $f(x) = 2^x - 2$	Down 2
Shift right $f(x - h)$	$f(x) = 2^{(x-h)}$	ex) $f(x) = 2^{x-2}$	Right 2
Shift left $f(x + h)$	$f(x) = 2^{(x+h)}$	ex) $f(x) = 2^{x+2}$	Left 2
Vertical Stretch $af(x),\ |a| > 1$	$f(x) = a \cdot 2^x$	ex) $f(x) = 2 \cdot 2^x$	vertical Stretch by 2
Vertical Shrink $af(x),\ 0 < |a| < 1$	$f(x) = a \cdot 2^x$	ex) $f(x) = \frac{1}{2} \cdot 2^x$	vertical Shrink by ½
Reflection about the x-axis $-f(x)$	$f(x) = -2^x$	reflect over x-axis	

What does the equation look like for each? Can you picture the graph as well?

✳ use $f(x) = 2^x$ as the

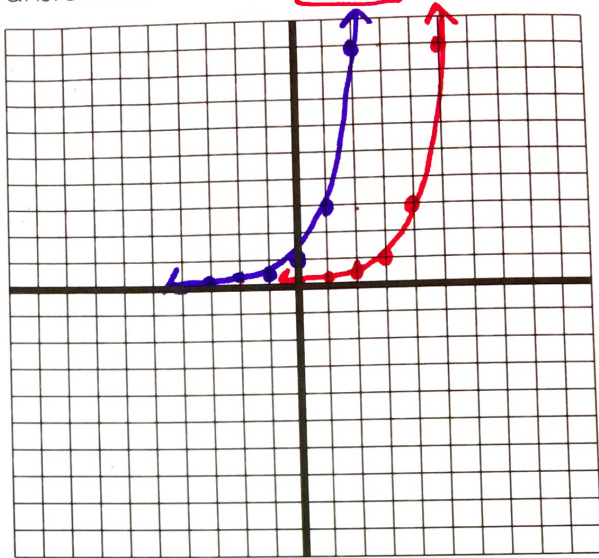|	
1) An exponential function reflected over the x-axis and shifted down 6 spaces $f(x) = -2^x - 6$	2) An exponential function that has been vertically stretched by a factor of 5 and shifted right 3 spaces $f(x) = 5 \cdot 2^{x-3}$
3) A linear function that has been shifted down 4 $f(x) = x - 4$	4) A linear function that has been shifted up by 6, and reflected over the x-axis $f(x) = -x + 6$
5) An exponential function that is vertically shrunk 1/3 $f(x) = \frac{1}{3}(2)^x$	6) An exponential function that moved to the right spaces and up 8 spaces $f(x) = 2^{x-5} + 8$

Using your table function on your calculator, graph the parent function and the transformed function on the same coordinate plane. Then, describe what type of transformation has occurred.

1. Parent Function: $f(x) = 2x$
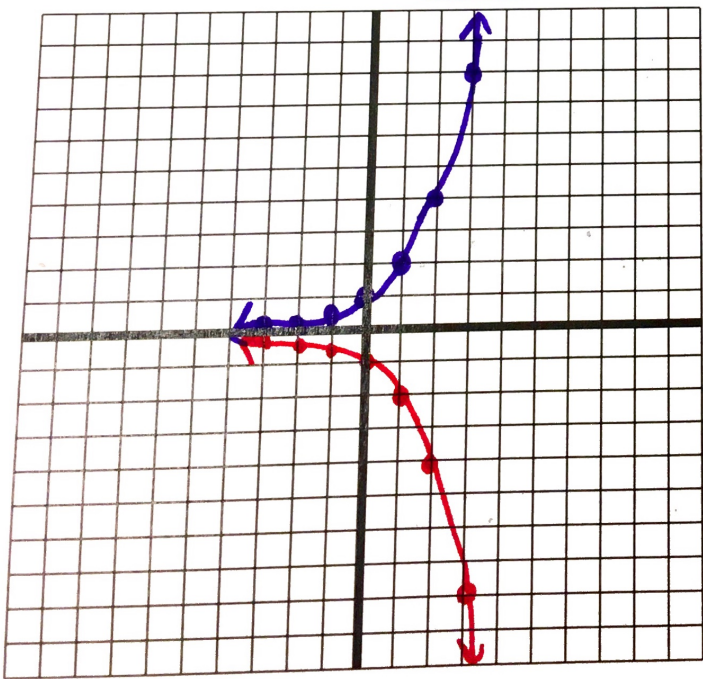   Transformed Function: $f(x) = 2^x - 2$

Transformations: Down 2

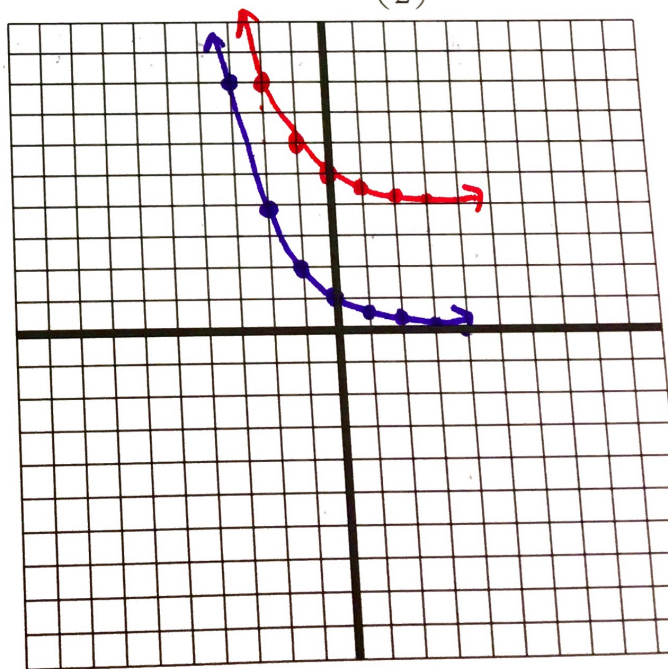2. Parent Function: $y = 3^x$
   Transformed Function: $y = 3^{x-3}$

Transformations: Right 3

3. Parent Function: $f(x) = 2^x$
   Transformed Function: $f(x) = -2^x$

Transformations: Reflect over x-axis

4. Parent Function: $y = \left(\dfrac{1}{2}\right)^x$
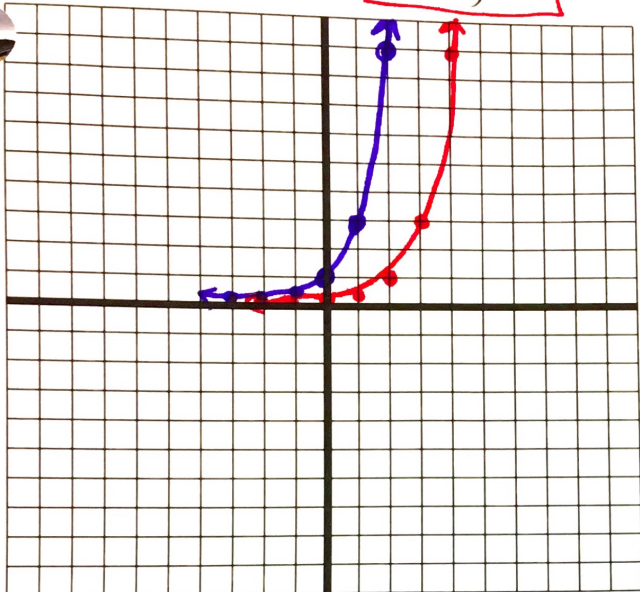   Transformed Function: $y = \left(\dfrac{1}{2}\right)^x + 4$

Transformations: Up 3

5. Parent Function: $f(x) = 3^x$

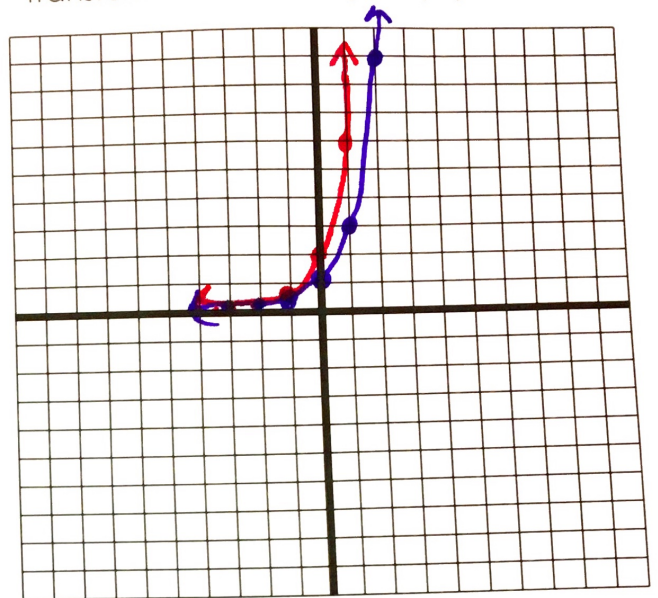Transformed Function: $f(x) = \dfrac{1}{9}(3^x)$

Transformations:

vertical shrink by 1/9
(y-values mult. by 1/9)

6. Parent Function: $y = 3^x$
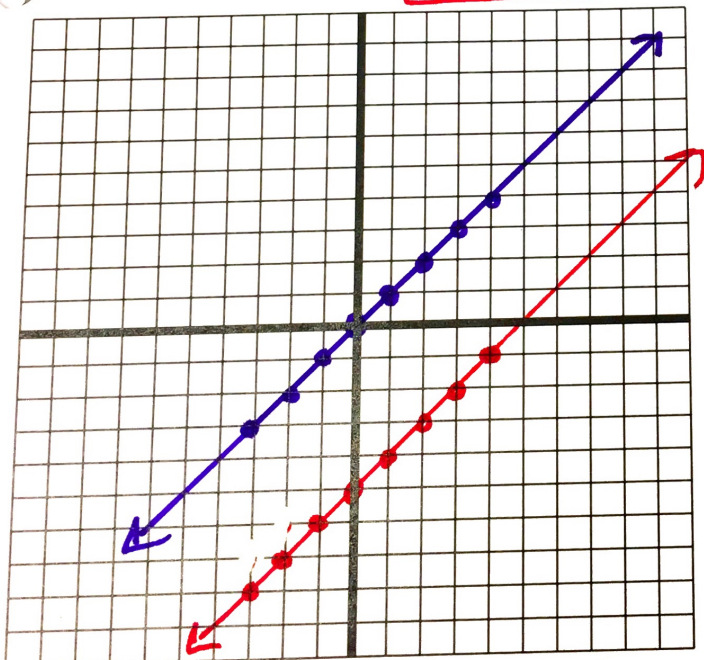
Transformed Function: $y = 2(3^x)$

Transformations:

vertical stretch by 2
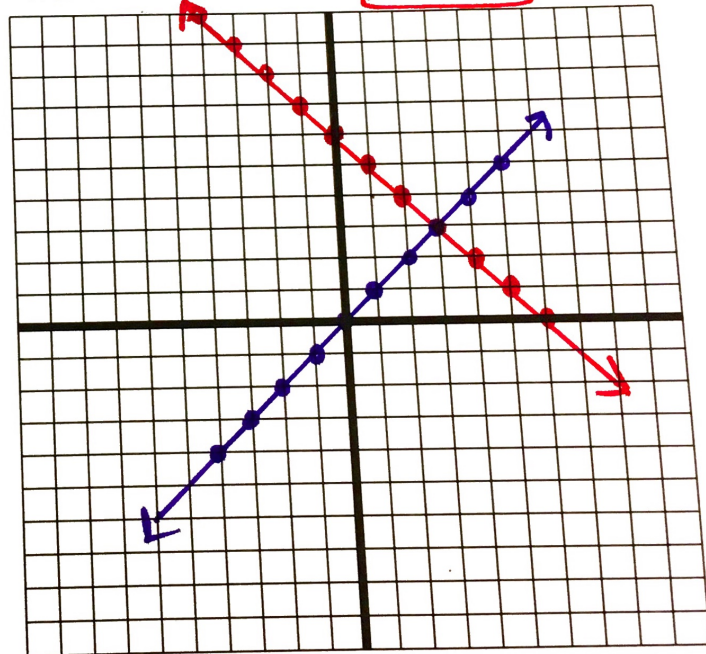(y-values mult. by 2)

7. Parent Function: $f(x) = x$

Transformed Function: $f(x) = x - 5$

Transformations:

8. Parent Function: $y = x$

Transformed Function: $y = -x + 6$

Transformations:

Reflect over x-axis
&
Up 6