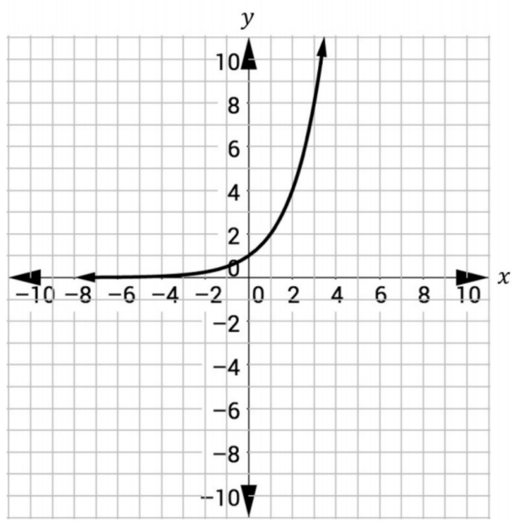
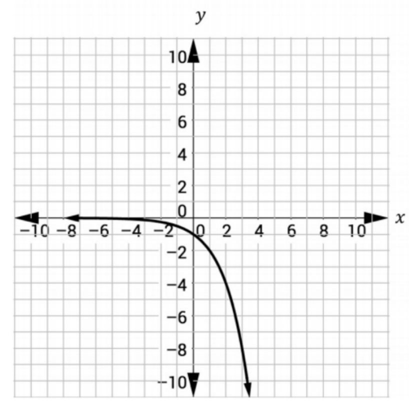
Consider the following exponential function.

$$f(x) = 2^x$$



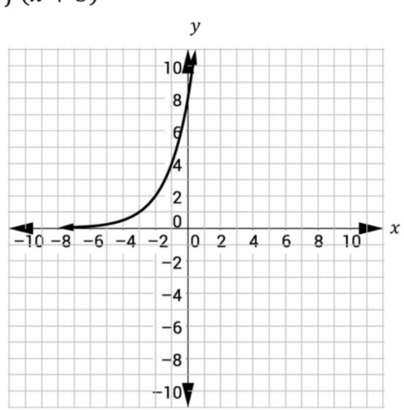
Consider the following transformations of $f(x)$. Write a function to represent each transformed function and describe the transformation.

$-f(x)$



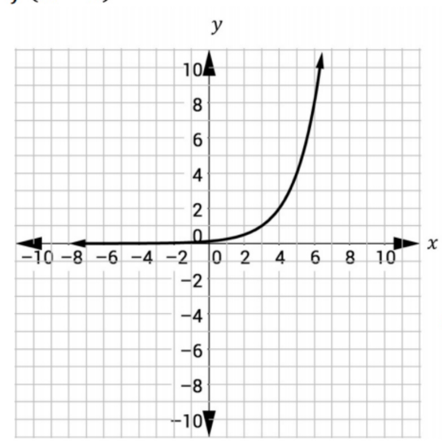
Transformed function: $f(x) = -2^x$
Description: reflected over the x axis

$f(x+3)$



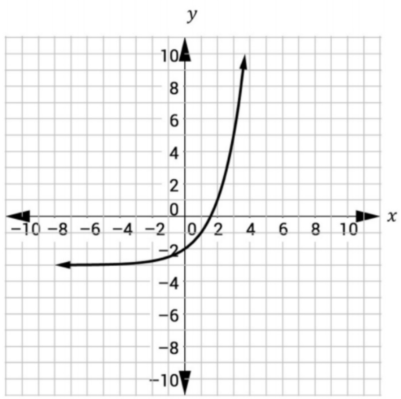
Transformed function: $f(x) = 2^{x+3}$
Description: Move 3 units to the left

$f(x-3)$



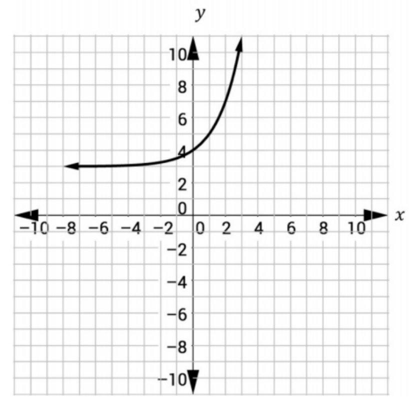
Transformed function: $f(x) = 2^{x-3}$
Description: Shift to the right 3 units

$f(x) - 3$



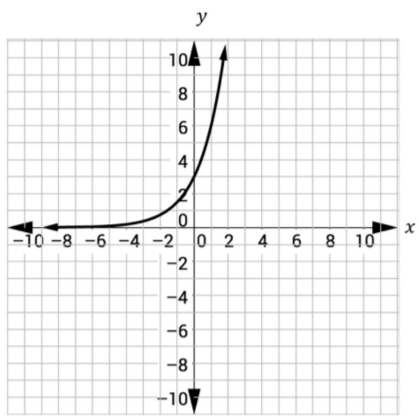
Transformed function: $f(x) = 2^x - 3$
Description: Shift down 3 units

$f(x) + 3$



Transformed function: $f(x) = 2^x + 3$
Description: Shift the graph up 3 units

$3f(x)$



Transformed function: $f(x) = 3 \cdot 2^x$
Description: Stretch vertically by a factor of 3

1. Describe how k affects the graph of the function $f(x) = 2^x$ in each of the following situations. Assume $k > 1$.

   a. $f(x) - k$

   Shift graph down

   b. $f(x + k)$

   shift graph left

   c. $kf(x)$

   vertically stretch

2. The function $g(x)$ represents an exponential function. The ordered pair $(6, -3)$ lies on the graph of $g(x)$.

a. The function $f(x) = g(x) + 5$. Name a point on the graph of $f(x)$.

(6, 2)

x	y
6	-3
6	2

b. The function $h(x) = g(2x)$. Name a point on the graph of $h(x)$.

(3, -3)

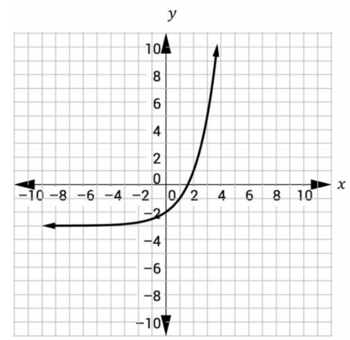
x	y
6	-3
3	-3

3. Recall the graph of $f(x) = 2^x$. Describe the graph of $f(x - 3) + 2$.

Shift right 3

Shift up 2

4. The following graph represents the function $f(x)$.



$2^x - 3$

$f(x)$ is a transformation of the exponential function $g(x) = 2^x + 1$. Write the exponential function for the graph.

BEAT THE TEST!

1. Consider the function $f(x) = \left(\frac{1}{2}\right)^x$. Describe the graph of each transformation.

$g(x) = f(x + 2)$	shift left 2 units
$h(x) = f(x) - 2$	shift down 2 units
$m(x) = -2f(x)$	Reflect over x axis vertically stretch by 2
$n(x) = f(x - 4)$	Shift right 4 units
$r(x) = f(x) + 3$	Shift up 3 units