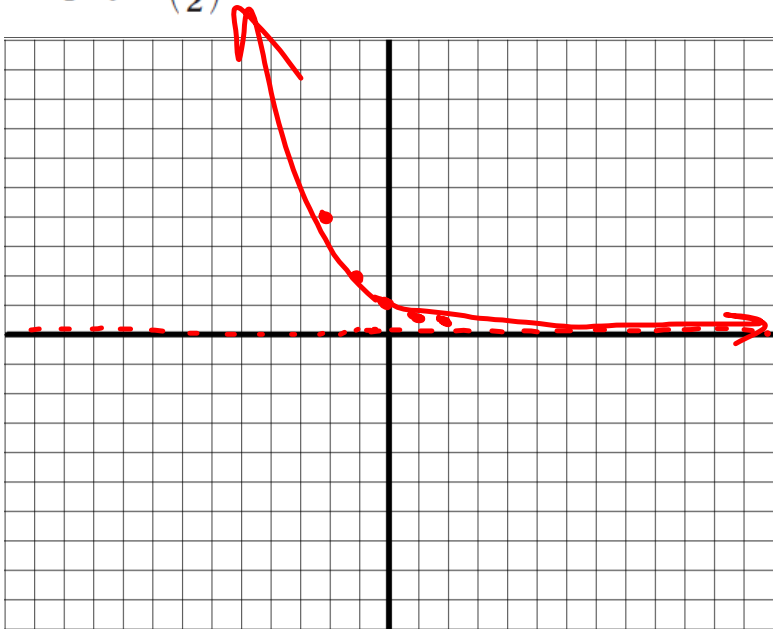
7.2 Graph Exponential Decay Functions

EXAMPLE 1 Graph $y = b^x$ for $0 < b < 1$

x	y
2	$\left(\frac{1}{2}\right)^2 = \frac{1}{4}$
1	$\left(\frac{1}{2}\right)^1 = \frac{1}{2}$
0	$\left(\frac{1}{2}\right)^0 = 1$
-1	$\left(\frac{1}{2}\right)^{-1} = 2$
-2	$\left(\frac{1}{2}\right)^{-2} = (2)^2 = 4$

Graph $y = \left(\frac{1}{2}\right)^x$.



Parent Function:

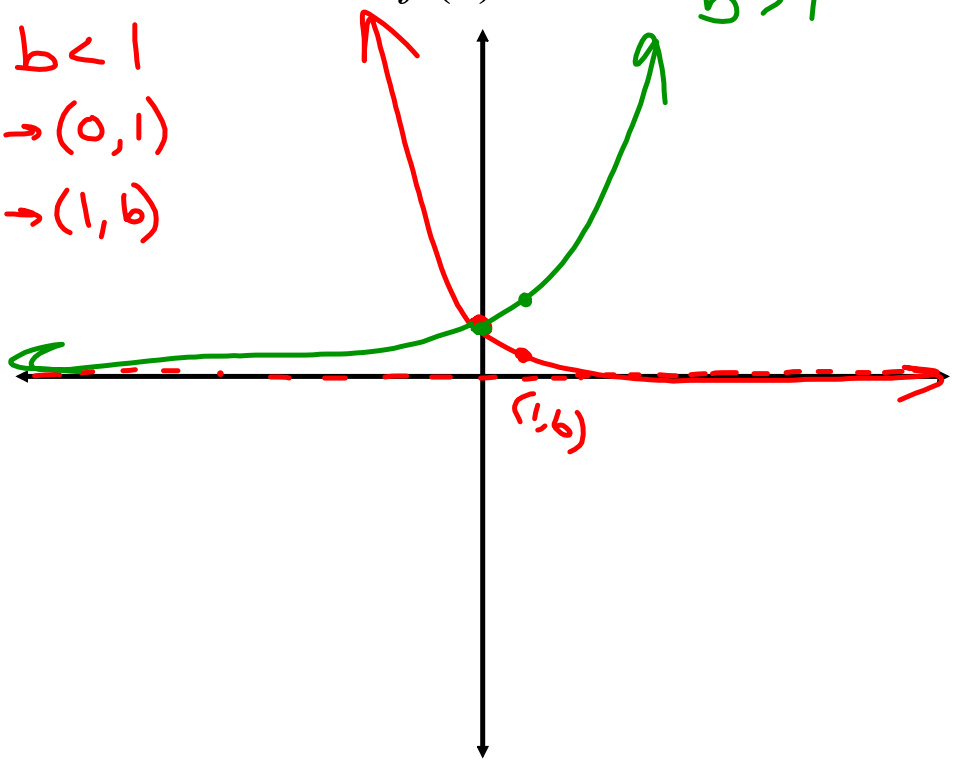
$f(x) = b^x$

$0 < b < 1$

$b^0 = 1 \rightarrow (0,1)$

$b^1 = b \rightarrow (1,b)$

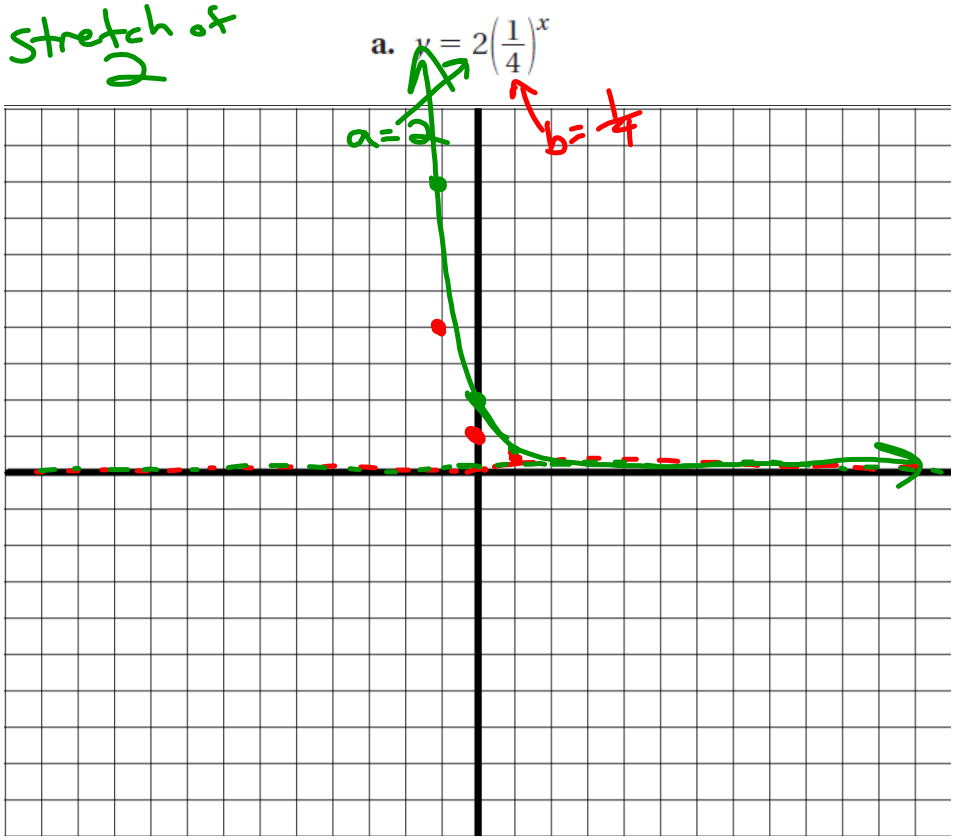
$b > 1$



EXAMPLE 2 **Graph $y = ab^x$ for $0 < b < 1$**

Graph the function.

a. $y = 2\left(\frac{1}{4}\right)^x$



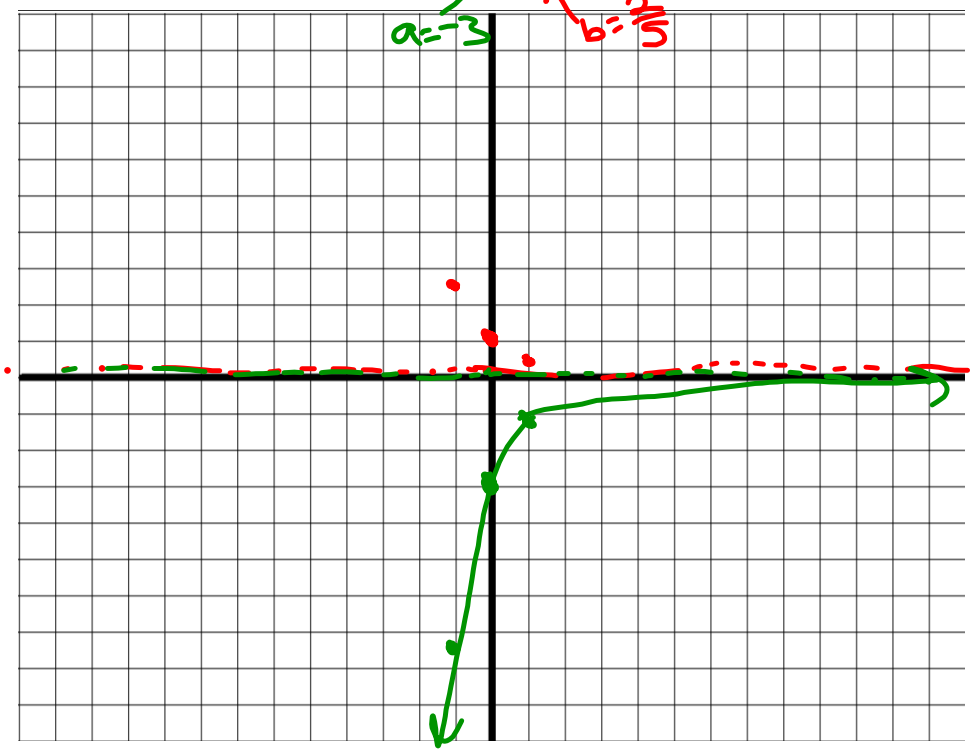
EXAMPLE 2 **Graph $y = ab^x$ for $0 < b < 1$**

Graph the function.

b. $y = -3\left(\frac{2}{5}\right)^x$

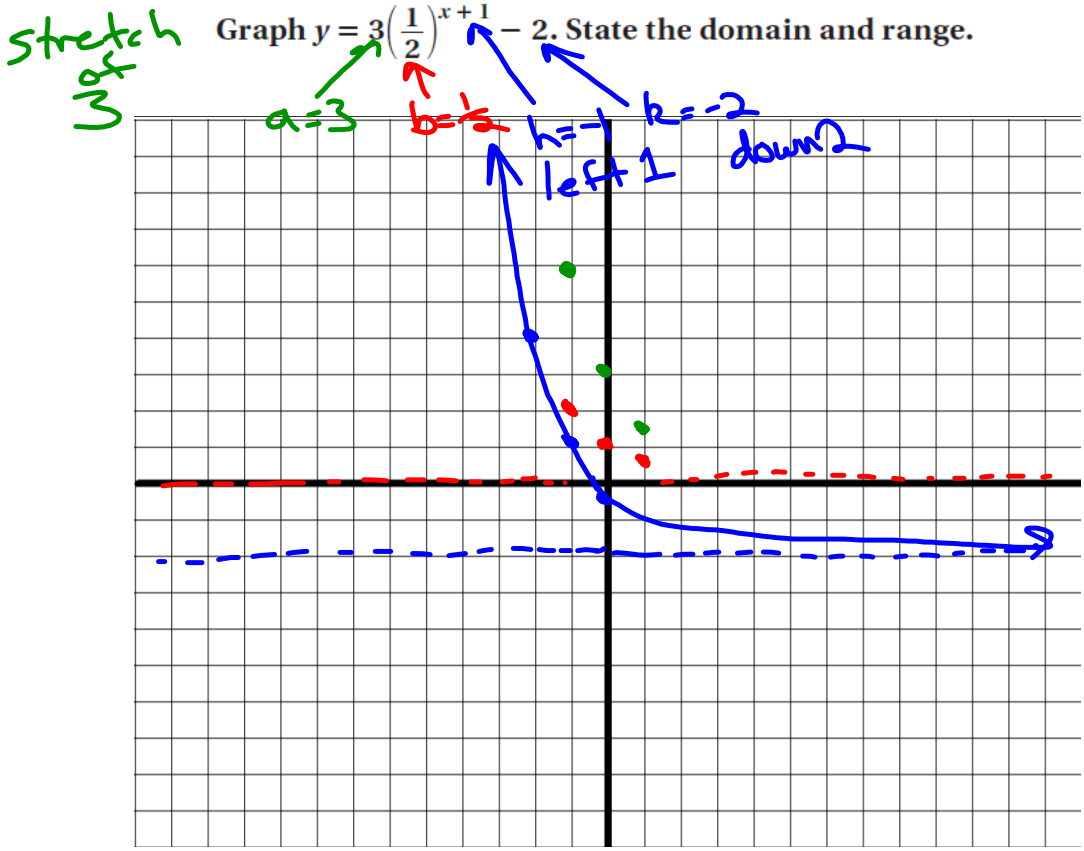
→ Flip over x-axis
→ Stretch of 3

$a = -3$ $b = \frac{2}{5}$



EXAMPLE 3 Graph $y = ab^{x-h} + k$ for $0 < b < 1$

Graph $y = 3\left(\frac{1}{2}\right)^{x+1} - 2$. State the domain and range.



Exponential Growth Formula

$$A = P(1+r)^t$$

A = end amount

P = starting amount

r = rate (%)

t = time (years)

Exponential Decay Formula

$$A = P(1-r)^t$$

EXAMPLE 4 **Solve a multi-step problem**

SNOWMOBILES A new snowmobile costs $4200. The value of the snowmobile decreases by 10% each year.

- Write an exponential decay model giving the snowmobile's value y (in dollars) after t years. Estimate the value after 3 years.

$A = P(1-r)^t$

$A = 4200(1-0.10)^t$

$A = 4200(0.9)^t$

$A = 4200(0.9)^3$

$A = 3061.80$