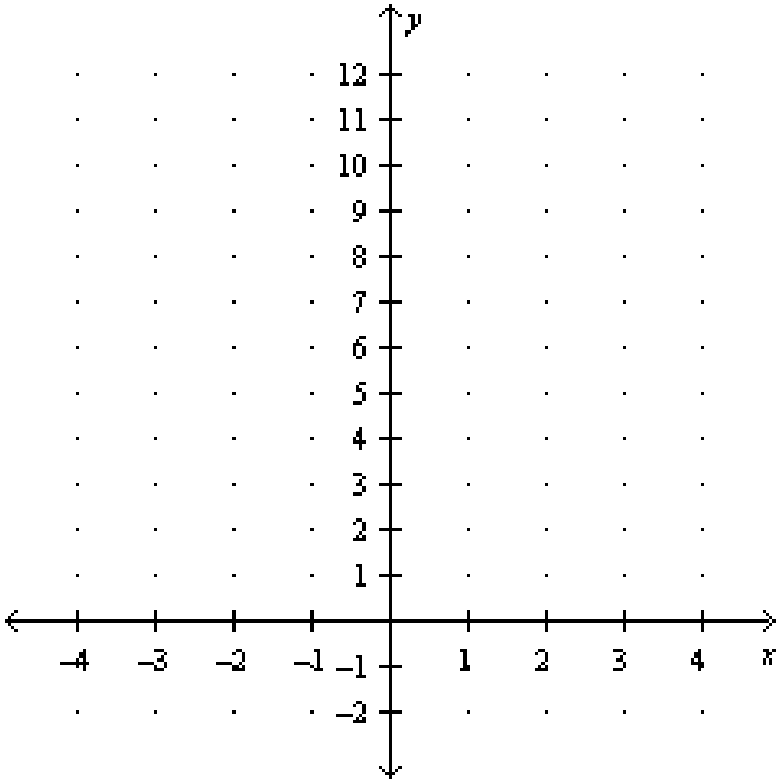
# #17 ~ Sect. 8.1: Exploring Exponential Models

An exponential function is a function with the general form $y = ab^x$, where x is a real number, $a \neq 0, b > 0$, and $b \neq 1$.

You can use an exponential function to model growth when b>1. When b>1, b is the growth factor .

Ex. 1 : Graph $y=3^x$

| $x$ | $y$ |
|---|---|
| $-3$ | $3^{-3} =$ |
| $-2$ | $3^{-2} =$ |
| $-1$ | $3^{-1} =$ |
| $0$ | $3^{0} =$ |
| $1$ | $3^{1} =$ |
| $2$ | $3^{2} =$ |
| $3$ | $3^{3} =$ |



You can use an exponential function to model population growth.
If you know the rate of increase r, you can find the
growth factor by using the equation b=1+r.

Ex. 2: The population of the US in 1994 was about 260 million with an average annual rate of increase of about 0.7%.

a. Find the growth factor for that year.

b. Suppose the rate of growth had continued to be 0.7%. Write a function to model this population growth.

You can write an exponential function from two points on the function's graph.

Ex. 3: Write an exponential function $y=ab^x$ for a graph that includes (1,6) and (0,2).

An exponential function can be used to model decay when 0<b<1. When b<1, b is a decay factor .

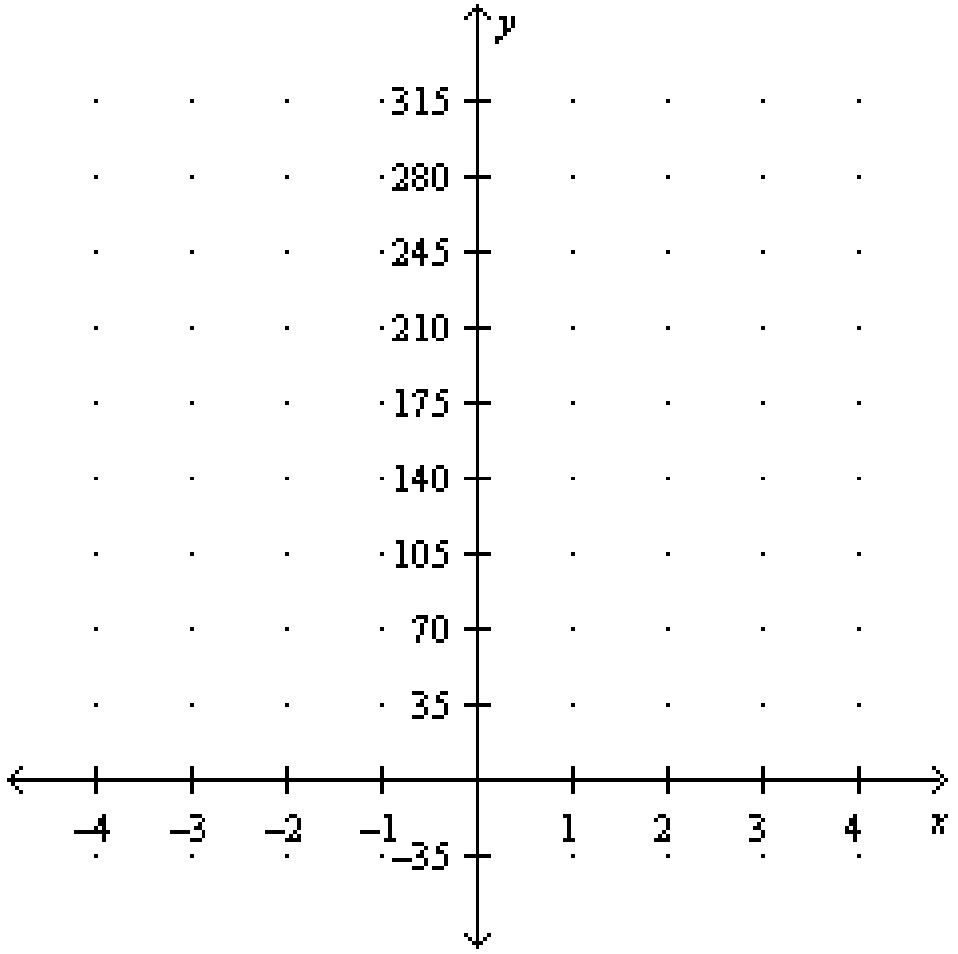
Ex. 4 : Without graphing, determine whether each function represents exponential growth or decay.

a. $y = 3\left(\frac{2}{3}\right)^x$ b. $y = 0.2(5)^x$ c. $y = 100(0.12)^x$

An asymptote is a line that a graph approaches as x or y increases in absolute value.

Ex. 5: Graph $y=36(0.5)^x$. Identify the horizontal asymptote.

| $x$ | $y$ |
|---|---|
| $-3$ | $36(0.5)^{-3} =$ |
| $-2$ | $36(0.5)^{-2} =$ |
| $-1$ | $36(0.5)^{-1} =$ |
| $0$ | $36(0.5)^{0} =$ |
| $1$ | $36(0.5)^{1} =$ |
| $2$ | $36(0.5)^{2} =$ |
| $3$ | $36(0.5)^{3} =$ |




horizontal asymptote =

Depreciation is the decline in an item's value resulting from age or wear. When an item loses about the same percent of its value each year, you can use an exponential function to model the depreciation.

Ex. 6: Suppose you want to buy a used car that costs $11,800. The expected depreciation of the car is 20% per year. Estimate the depreciated value of the car after 6 years.