Graphing Exponential Applications

The general formula for an exponential relation is $y = a(b)^x$, where b is the growth (or decay) factor, and a is the initial value.

$y = a(b)^x$ represents **exponential growth** if $b > 1$.
$y = a(b)^x$ represents **exponential decay** if $0 < b < 1$.

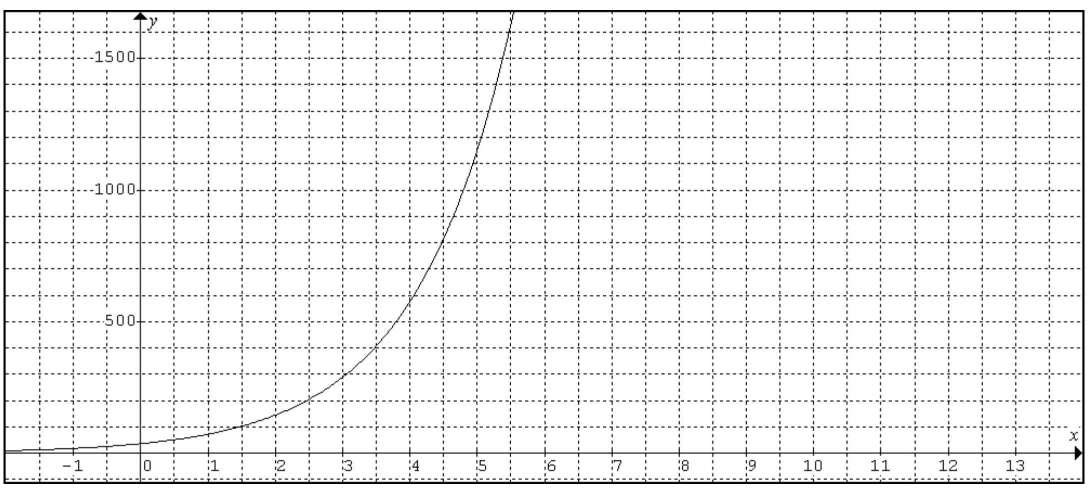
Exponential relations occur in science (population growth, radioactive decay) and in finance (compound interest).

Example 1: The number of a certain bacteria doubles every hour. The initial population in a culture of bacteria is 36.

a. Write an equation that represents the relationship between the number of hours passed versus the population of bacteria.

$$y = 36(2)^x$$

b. Sketch the graph.



c. Determine the number of bacteria after 8h.

$y = 36(2)^8$ (Eight doublings in eight hours)
$y = 9216$

Converting Percentages to Growth/Decay Rates

Example 2: An investment increases by 5% a year. What is the growth rate of this investment?

A 5% increases implies a growth rate of 100 + 5 = 105% = 1.05

Example 3: The value of a certain kind of car depreciates by 12% per year. What is the decay rate of the value of this vehicle?

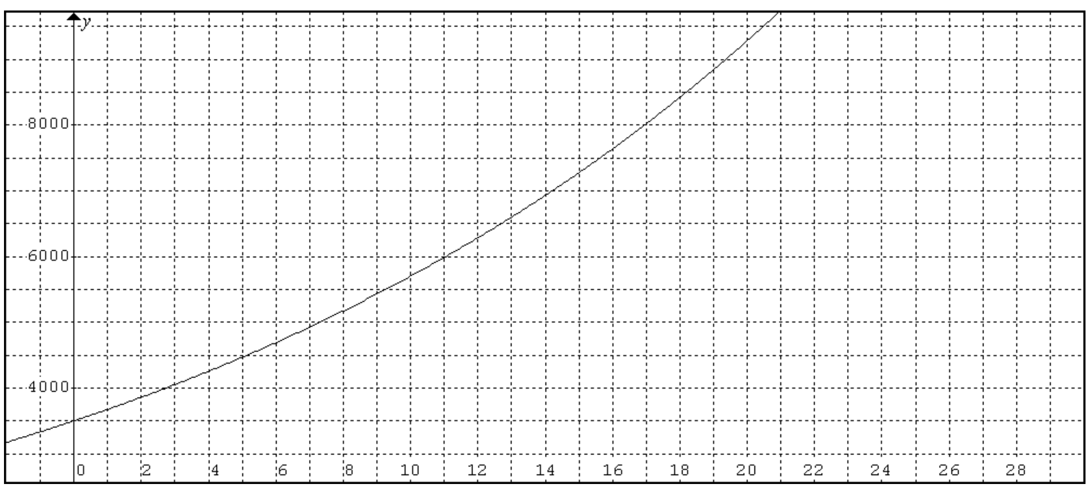
A 12% decreases implies a decay rate of 100 – 12 = 88% = 0.88

Example 4. A small town's population was 3500 in 1980. It increases by 5% each year.

a. Write an equation that represents the relationship between the number of years passed versus the population of the town.

$$y = 3500(1.05)^x$$

b. Sketch the graph.



c. Determine the population of the town today (2014).

$$y = 3500(1.05)^{34}$$
$$y = 18386$$

About 18400 people.

Practice: pg. 67 #12, 13, 14, 16