Journal Entry:
Describe the differences between a linear function and an exponential function. Include differences in their graphs, tables of values, and equation form. Give an example of each and graph them.

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Section 7-7
Exponential Growth and Decay

Students will be able to model exponential growth and decay.

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An exponential function can model growth or decay.

Key Concept Exponential Growth

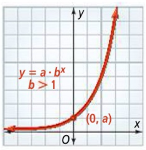
Definitions

Exponential growth can be modeled by the function $y = a \cdot b^x$, where $a > 0$ and $b > 1$. The base b is the **growth factor,** which equals 1 plus the percent rate of change expressed as a decimal.

Algebra

initial amount (when $x = 0$)
↓
$y = a \cdot b^x$ ← exponent
↑
The base, which is greater than 1, is the growth factor.

Graph



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Suppose in 1985 there were 285 cell phone subscribers in South Dakota. If the number of subscribers increased exponentially by 75% each year, how many would there be in 1994? in 2014?

$y = ab^x$

1994 - 1985

$y = (285)(1.75)^9 \approx 43,872$

1.75 = 1 + .75

$y = (285)(1.75)^{29} = 31,838,18,280$

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How does a savings account work?

Compound interest - interest the bank pays based on the money put in and the interest already earned

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Compound interest formula:

$A = P\left(1 + \frac{r}{n}\right)^{nt}$

A = the balance
P = the principal (the initial deposit)
r = the annual interest rate (expressed as a decimal)
n = the number of times interest is compounded per year
t = the time in years

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Your grandma wants to start a college savings fund for you when you are 6. She decides to invest $8000 in a money market account that pays 3.25% interest compounded monthly. How much money will she be able to give to you on your 18th birthday?

$A = 8000\left(1 + \frac{.0325}{12}\right)^{12 \cdot 12}$

$8000(1 + .0027)^{144}$

$11,809.62

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In our formula for exponential growth/ decay

$y = a \cdot b^x$

The b tells us whether it is exponential growth or decay.

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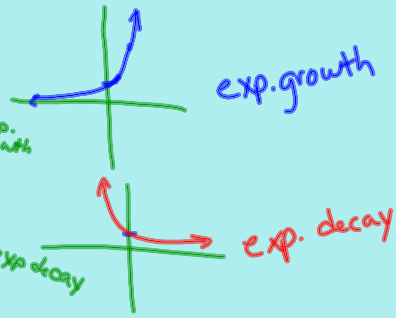
Graph:

$y = 1.5^x$

$b > 1$ → exp. growth



$y = (1/2)^x$

$0 < b < 1$ → exp decay

What does the b have to do with growth/ decay?

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Suppose the population of Howard was 1455 in 1991. Since then, the population has been decreasing at a rate of 1.7%. How many people would there be in 2014?

$y = ab^x$

$y = 1455(1 - .017)^{23}$

$= 1455(.983)^{23} = 980$

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Hwk: pg. 464 - 465
#10 - 22(4th), 24 - 34 evens, 36, 37, 39

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