Exponential Growth & Decay Functions

Name _____ Period ____

Day	$1000/day	1¢ doubled
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
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23		
24		
25		
26		
27		
28		
29		
30		

Exponential Function

A function in which the variable is an exponent

$f(x) = a^x$ where $a > 0$ (and $\neq 1$)

Examples:

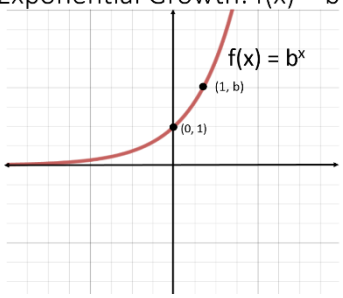
$f(x) = 3^x$

$f(x) = \frac{1^x}{2}$

$f(x) = .8^x$

$f(x) = 1.2^x$

Exponential Growth: $f(x) = b^x$ where $b > 1$



Domain:

Range:

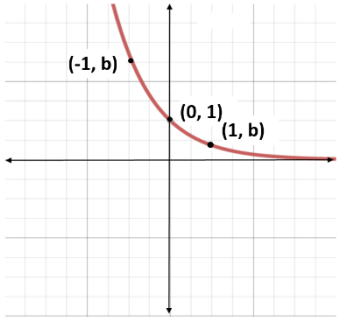
Increasing:

Decreasing:

y-intercept:

Asymptote:

Exponential Decay: $f(x) = b^x$ where $0 < b < 1$



Domain:

Range:

Increasing:

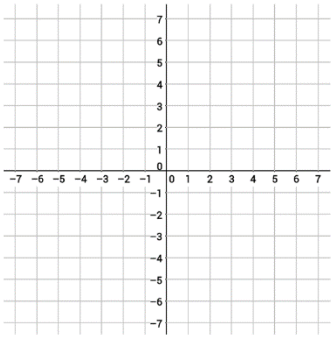
Decreasing:

y-intercept:

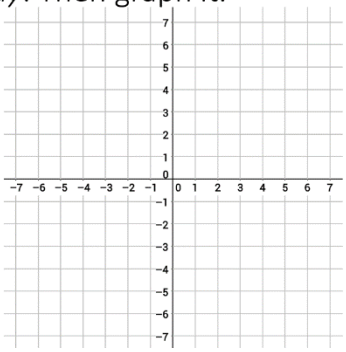
Asymptote:

Go to Desmos

Tell whether $y = (1.3)^x$ represents *exponential growth* or *exponential decay*. Then graph it.



Tell whether $y = \left(\frac{1}{3}\right)^x$ represents *exponential growth* or *exponential decay*. Then graph it.



Exponential Models

Exponential Growth Model

$y = a(1 + r)^t$

Exponential Decay Model

$y = a(1 - r)^t$

Lesson 6.1 p. 300; 1, 3-7 odd, 9 – 15 odd

The value of a car y (in thousands of dollars) can be approximated by the model $y = 31(0.92)^t$, where t is the number of years since the car was new.
a. Tell whether the model represents exponential growth or exponential decay.
b. Identify the annual percent increase or decrease in the value of the car.

c. Estimate when the value of the car will be $9600.

1. The value of a car y (in thousands of dollars) can be approximated by the model $y = 32(0.88)^t$, where t is the number of years since the car was new.

a. Identify the annual percent increase or decrease in the value of the car.

b. Estimate when the value of the car will be $9600.

In 2000, the population of a city was about 1.04 million. During the next 14 years, the population increased by about 2.05% each year.
a. Write an exponential growth model giving the population y (in millions) t years after 2000. Estimate the city's population in 2008.

b. Estimate the year when the city's population was 1.3 million.

In 2016 the US population is believed to be 324,118,787 people. With a current growth rate of .73%, write an exponential growth model giving the population y (in millions) t years after 2016.

Estimate the US population in 2020.

What would the population by in 2025?

The amount y (in grams) of the radioactive isotope barium-140 remaining after t days is
y = a(0.5)t/13, where a is the initial amount (in grams). What percent of the barium-140 decays each day?

The amount y (in grams) of the radioactive isotope iodine-123 remaining after t hours is $y = a(0.5)^{t/13}$, where a is the initial amount (in grams). What percent of the iodine-123 decays each hour?

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

You deposit $8600 in an account that pays 1.32% annual interest. Find the balance after 4 years when the interest is compounded quarterly.

Find the amount A in an account earning compound interest after 5 years when the principal is $5000 and the interest rate is 2.25% compounded quarterly.

Find the amount A in an account earning compound interest after 5 years when the principal is $5000 and the interest rate is 1.75% compounded monthly.

The number of bacteria y (in thousands) in a culture can be approximated by the model $y = 100\ (1.99)^t$ where t is the number of hours the culture is incubated.
a. Tell whether the model represents exponential growth or exponential decay.
b. Identify the hourly percent increase or decrease in the number of bacteria.
Estimate when the number of bacteria will be 1,000,000.