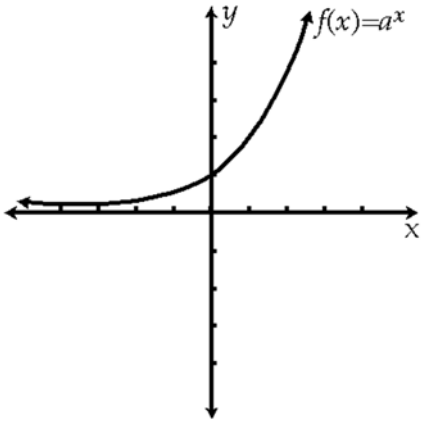
Writing and Graphing Exponential Functions

Exponential Function: $\boxed{y = ab^x}$ $(\text{OR } y = b^x)$



where a $\neq$ 0, $b > 0$ *and* $b \neq 1$

Domain:

(left to right)

Range:

(Top to bottom)

Asymptote:

For exponential equations, the "unknown" or the "x" value is the exponent. Example $y = 4^x$

Compare

Linear Function: $y = 3x + 2$

x	-2	-1	0	1	2
y	-4	-1	2	5	8

Exponential Function: $y = 2 \bullet 3^x$

x	-2	-1	0	1	2
Y	$\frac{2}{9}$	$\frac{2}{3}$	2	6	18

Review of Negative Exponents

Evaluate:

Ex 1) 3^{-2}

Ex 2) 7^{-1}

Ex 3) 2^{-3}

Writing the Equation of an Exponential Function

1. Tell whether the function is exponential. Determine what each y value is multiplied by to get the next y value. This is the "b" value
2. Find the value of a by finding the value of y when $x = 0$
3. Write the function rule

Write an equation for each function.

Ex 4) Ex

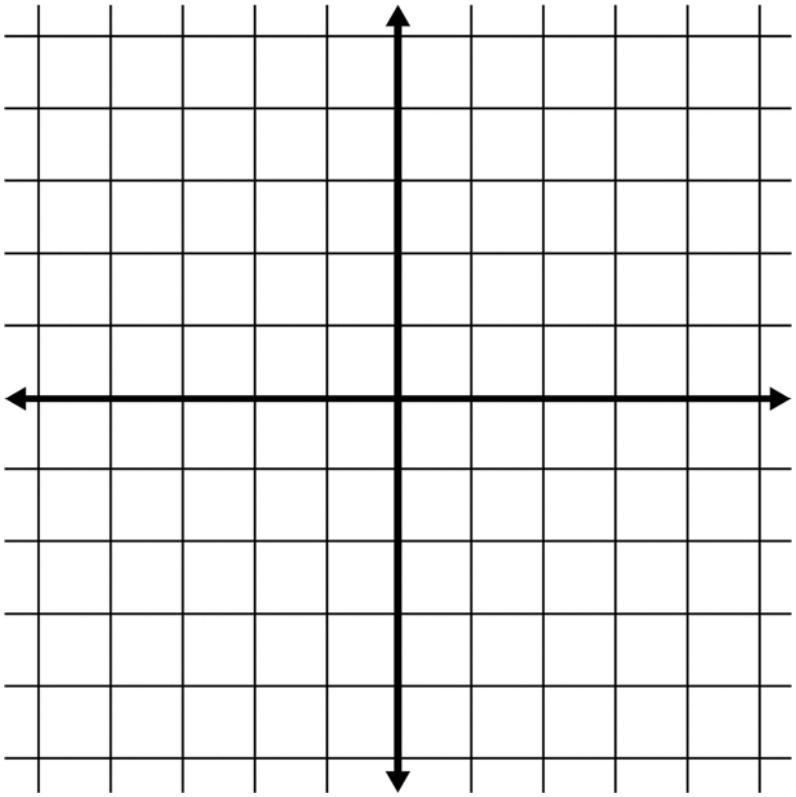
x	-2	-1	0	1	2
y	2	4	8	16	32

5)

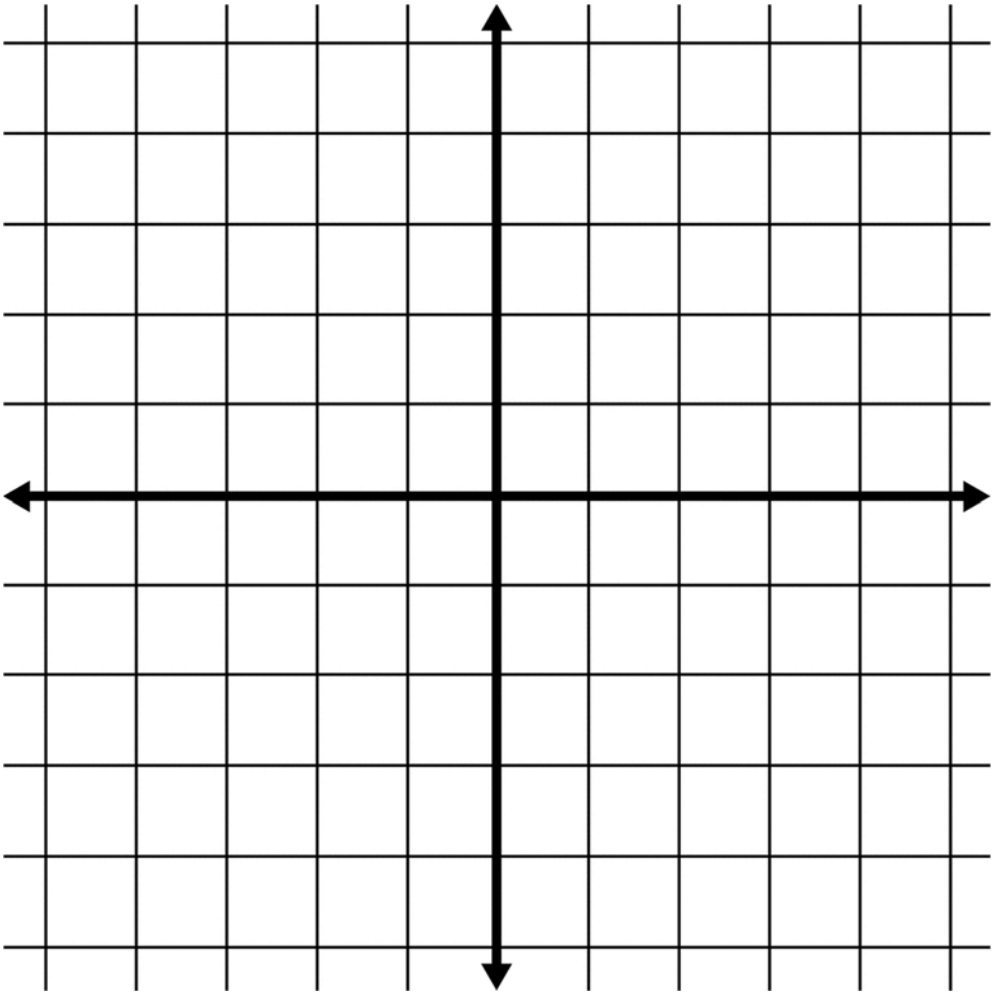
x	-2	-1	0	1	2
y	5	25	125	625	3125

Graphing Exponential Functions

Ex 6) Graph $y = 2^x$ and identify its domain and range.



Ex 7) Graph the functions $y = 3 \bullet 2^x$ and $y = 2^x$



Exponential Growth

a is the initial amount

r is the growth rate (as a decimal NOT a percentage)

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

1+r is the growth factor

t is the time period

An **exponential function** is *increasing* when b is greater than 1. (for $y = a \bullet b^x$)

Examples of exponential growth functions: $y = 5^x$ $y = 2 \bullet 4^x$ $y = 2.5 \bullet 3^x$

**ALL of the graphs we just graphed THUS FAR are examples of exponential growth functions– this is because they are exponential equations AND because the *b* value is greater than 1.

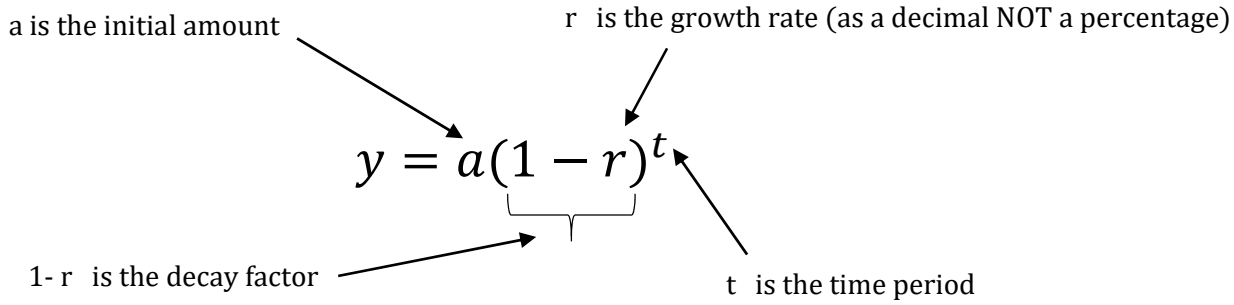
- Notice how the y values are INCREASING from left to right

Compound Interest

Compound Interest:

Ex 9) You put $250 in a savings account that earns 4% annual interest compounded yearly. You do not make any deposits or withdrawals. How much will your investment be worth in 5 years?

Exponential Decay

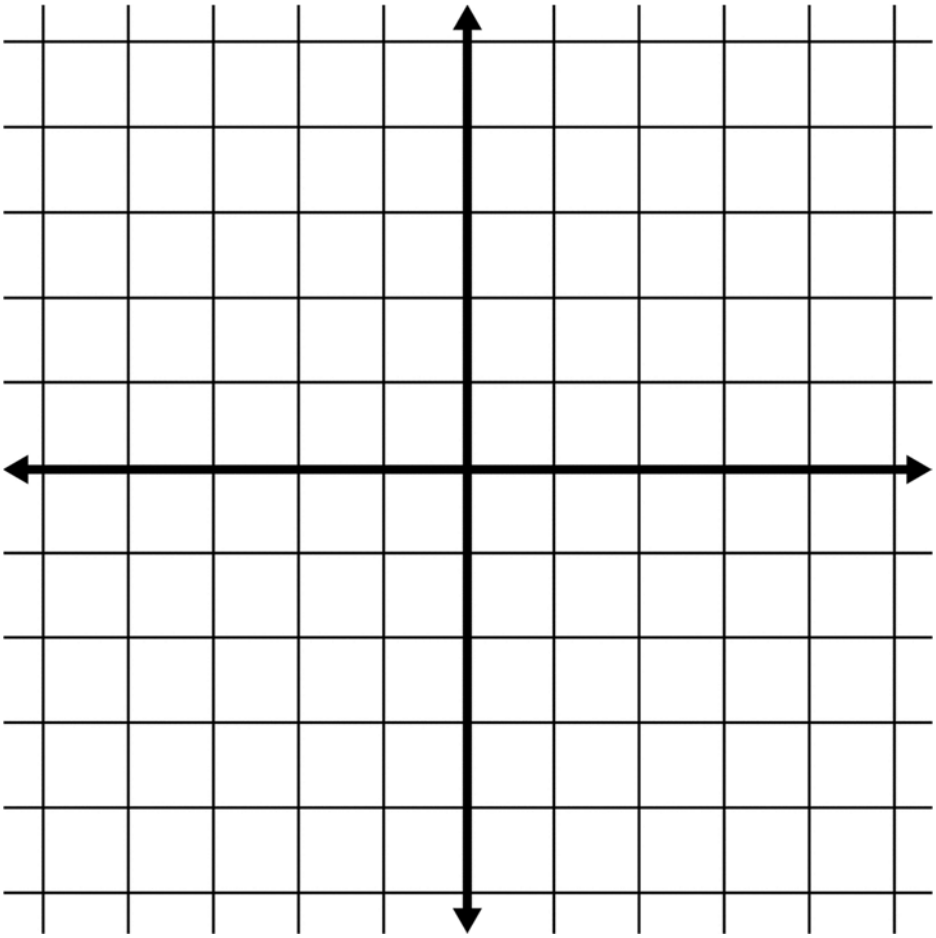


An exponential function is decreasing when b is between 0 and 1. (for $y = a \bullet b^x$)

Examples of exponential decaying functions: $y = (\frac{1}{3})^x$ $y = 1 \bullet \frac{2}{3}^x$ $y = 2.5 \bullet \frac{1}{4}^x$

**The y values (when you construct a chart) are DECREASING from left to right

Ex 10) Graph $y = (\frac{1}{2})^x$ and identify its domain and range.



Ex 7) Graph the functions $y = 3 \bullet (\frac{1}{2})^x$ and $y = -\frac{1}{3} \bullet (\frac{1}{2})^x$