EXPONENTIAL FUNCTIONS

KEY

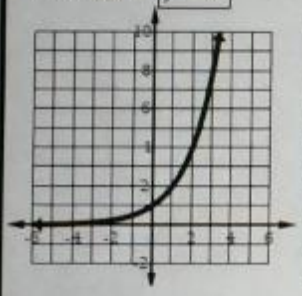
$$y = a \cdot b^x$$

An exponential function is defined by $f(x) = a \cdot b^x$ with base b.

- The base, b, is a constant such that $b > 0$ and $b \neq 1$.
- $a \neq 0$
- The exponent, x, is a variable. x is any real number.

WOW!

Example 1: $y = 2^x$



Fill in the table:

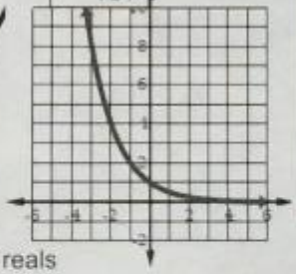
x	y = f(x)
-2	1/4
-1	1/2
0	1
1	2
2	4
3	8

The domain is All reals

The range is (0,∞)

Example 2: Finish the table, graph the function, and answer the questions below.

$y = \left(\frac{1}{2}\right)^x$



x	y = f(x)
-3	8
-2	4
-1	2
0	1
1	1/2
2	1/4

The domain is All reals

The range is (0,∞)

PROPERTIES OF EXPONENTIAL GRAPHS $y = a \cdot b^x$

The domain is (- ∞,∞)

The range is (0,∞)

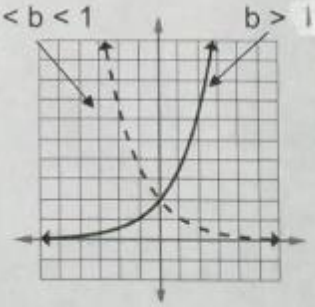
The graphs have a y-intercept at (0,a)

When b > 0, the graph Increases

When 0 < b < 1 the graph Decreases

The graphs have an asymptote at y = 0 x-axis

0 < b < 1 b > 1



BAM!

Exponential Functions

Exponential Growth

$y = a \cdot b^x$

a is the initial amount.

b is the growth factor when $b > 1$

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

If we rewrite b as $(1 + r)$, we can determine the **GROWTH RATE**, r. r is usually a percentage and written as a decimal

Example 3:

$y = 2(1.43)^x$

Growth factor 1.43

Growth rate .43

Initial value 2

Exponential Decay

KEY

$y = a \cdot b^x$

a is the initial amount.

b is the decay factor when $0 < b < 1$

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

If we rewrite b as $(1 - r)$, we can determine the **DECAY RATE**, r. r is usually a percentage and written as a decimal

Example 4: $y = 300(.75)^x$

Decay factor .75

Decay rate .25

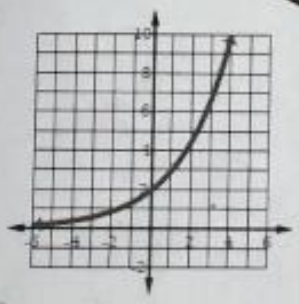
Initial value 300

WHAM!

Example 5: Given the following growth function, use the table to help sketch the graph and answer the questions below.

$y = 2(1.5)^x$

x	y = f(x)
-2	8/9
-1	4/3
0	2
1	3
2	4.5
3	6.75



Growth/Decay factor 1.5

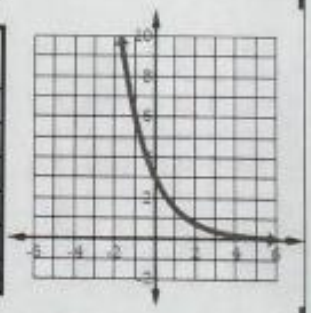
Growth/Decay rate .5

Initial value 2

Example 6: Given the following decay function, use the table to help sketch the graph and answer the questions below.

$y = 2\left(\frac{1}{3}\right)^x$

x	y = f(x)
-2	18
-1	6
0	2
1	2/3
2	2/9
3	2/27



Decay factor 1/3

Decay rate 2/3

Initial value 2