

Graphs of Exponential Functions

General Form of an Exponential Equation:

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

Diagram illustrating the components of the exponential equation $y = a \cdot b^x$:

- a : Coefficient, $a \neq 0$
- b : Base, $b > 0, b \neq 1$
- x : Exponent, any real #

Using the graphing calculator do the following:

Graph $Y_1 = 1 \cdot 2^x$

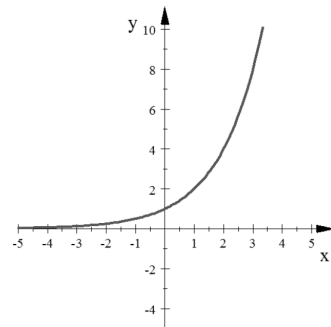
Use the following window: $X_{\min} = -5$ $X_{\max} = 5$ $Y_{\min} = -5$ $Y_{\max} = 10$

Describe this graph

The graph increases from left to right.

The rate of increase speeds up as you move to the right.

What is the y-intercept? $(0, 1)$



Leaving $Y_1 = 1 \cdot 2^x$ graph $y = 1 \cdot b^x$ for two other values of b bigger than 2 in Y_2 and Y_3 .

1. Make a sketch of all three graphs labelling each graph with its equation.

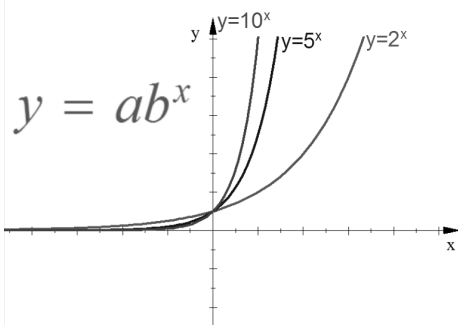
See graphs on next page

2. Describe what changing the value of b does to the graph.

this is answered in 2 pages

When $b > 1$ the graph represents Exponential Growth.

in this case b is called the Growth Factor

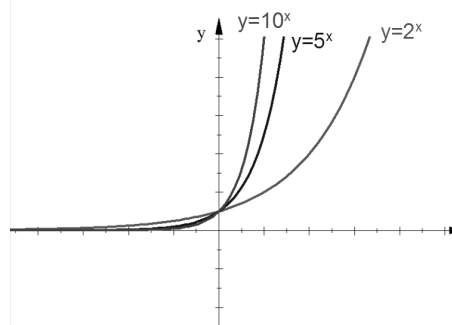


$y=2^x$
 $y=5^x$
 $y=10^x$

What point do all 3 graphs have in common?

y-int = 1

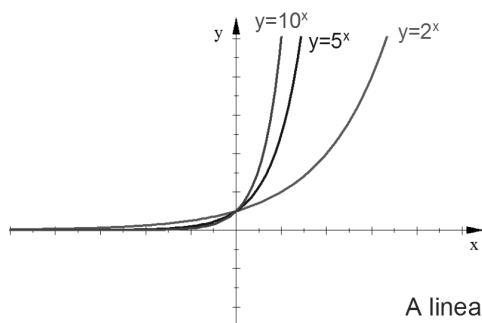
$$y = ab^x$$



As b gets larger the graph increases/grows faster ("steeper")

$$y = ab^x$$

What happens to each graph as you move farther to the left?

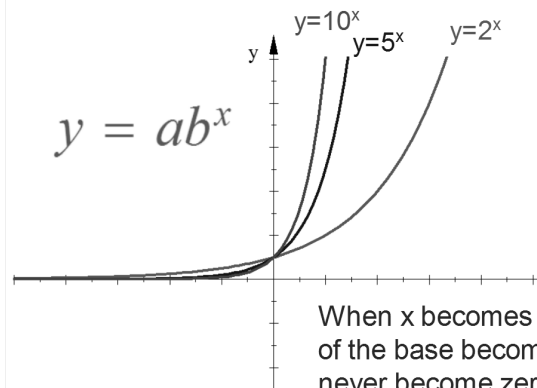


The graph flattens out and approaches the x-axis, but never actually reaches or crosses it.

The x-axis is called a Horizontal Asymptote.

A linear asymptote is a line your graph gets very close to the farther away from the origin you are, but never quite reaches.

$$y = ab^x$$



Why will these graphs never reach or cross the x-axis as you move farther and farther to the left?

When x becomes bigger negative the reciprocal of the base becomes a smaller number but will never become zero or negative.

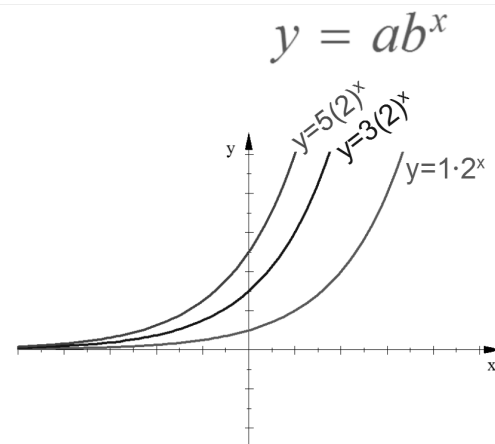
Leaving $Y_1 = 1 \cdot 2^x$ change a from 1 to two other positive values. Graph these equations in Y_2 and Y_3 .

1. Make a sketch of all three graphs labelling each graph with it's equation.

see next page for the graphs

2. Describe what changing the value of a does to the graph.

see next page for the answer to this question



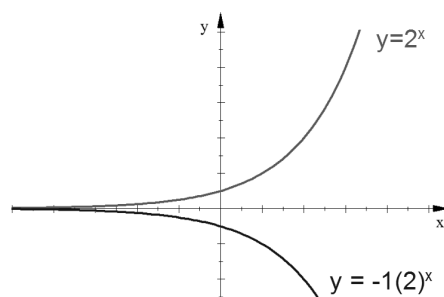
What does changing the value of a in the equation do to the graph?

changing the value of a in the equation changes the y-intercept

a = the y-intercept

$$y = ab^x$$

What does a negative value of a do to the graph?



x-axis reflection
Upside Down

just like
 $y = -x^2$
 $y = -|x|$
 $y = -\sqrt{x}$

all these graphs
are upside down
compared to
the parent function.