Exponential Function:
An exponential function is one in which a variable is located in the exponent

ex: $y = 2^x$

Part 1 8-7 page 430

(a) $y = a \cdot b^x$ is the **general form** for an Exponential Eq.

(b) What are the allowed values for

x : Any real number

a : $a \neq 0$

b : $b>0$ and $b \neq 1$

Part 2 8-8 page 437

b is the **base** of this function. When $b > 1$ the equation $y = a \cdot b^x$ models Exponential Growth

and b is called the Growth Factor

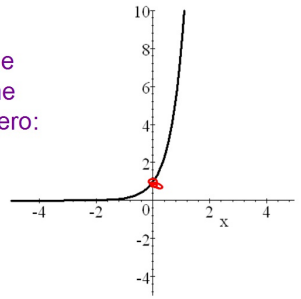
Part 3 Graphing Calculator Exercises

A) Use a graphing calculator and graph $Y_1 = 2^x$

B) What is the y-intercept?

It looks like it passes through the y-axis at 1. You can also find the y-intercept by replacing x with zero:

$y = 2^0 = 1$

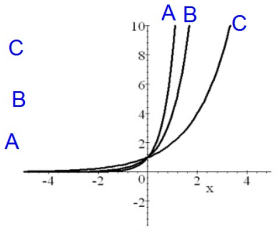


C) In Y_2 and Y_3 graph $y = b^x$ for two other values of b bigger than 2, such as $Y_2 = 4^x$ and $Y_3 = 8^x$

$Y_1 = 2^x$ C

$Y_2 = 4^x$ B

$Y_3 = 8^x$ A



E) What happens to the graphs as b increases?

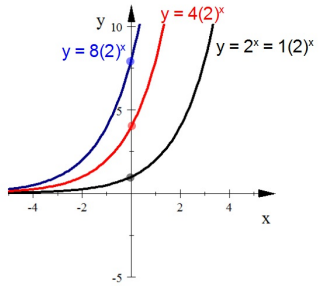
As the base increase the graph grows faster

F) What point do all three graphs have in common?

The same y-intercept

A) Leaving $Y_1 = 2^x$ (this is where $a = 1$ & $b = 2$) Graph in Y_2 and Y_3 $y = a \cdot 2^x$ for 2 other positive values of a. For example, graph $Y_2 = 4 * 2^x$ and $Y_3 = 8 * 2^x$

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



C) Explain what changing the value of a does to the graph.

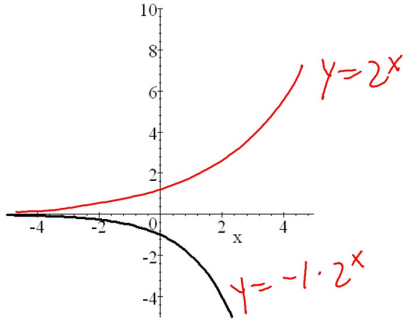
It changes the y-intercept

D) Now graph $y = a \cdot 2^x$ for a negative value of a.

What does this do to the graph?

Reflects over the x-axis (upside down)

$y = -1 \cdot 2^x$



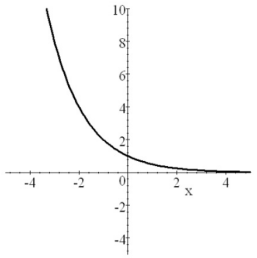
Part 5 Sec 8-8 page 440

A) When the value of b is between 0 and 1, $0 < b < 1$,

then the equation $y = a \cdot b^x$ models Exponential Decay

and b is called the Decay Factor

B) Graph $Y_1 = 0.5^X$



C) Describe how this graph is different from the graphs in Part 3.

The graph decreases as you move to the right.

$$y = a(b)^x$$

y= amount at the end

a = the y-intercept of the graph or
the original amount.

b = the Growth Factor if b>1
the bigger b gets the faster the graph grows

or

the Decay Factor if 0<b<1
the smaller b gets the faster the graph decays

Find the y-intercept for each:

1. $y = 0.125(3)^x$ y-int = 0.125

2. $y = 9^x$ y-int = 1

Exponential Growth:

1. $y = 16(1.057)^x$ 2. $y = 0.39(5)^x$ 3. $y = 6(1.068)^x$

Which graph is steeper?

#2, it has the largest base

Which graph is flatter?

#1, it has the smallest base

Exponential Decay

1. $y = 0.75(0.962)^x$ 2. $y = 39(0.45)^x$ 3. $y = 8(0.72)^x$

Which graph is steeper?

#2, it has the smallest base

Which graph is flatter?

#1, it has the largest base

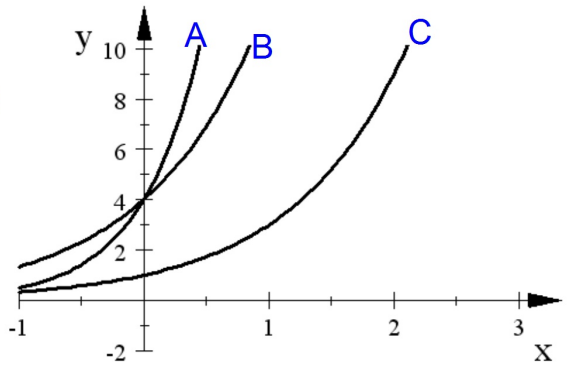
For exponential growth: The bigger the base the steeper the graph.

For exponential decay: The smaller the base the steeper the graph.

For Exponential Graphs in general:
The closer the base is to 1 the flatter the graph

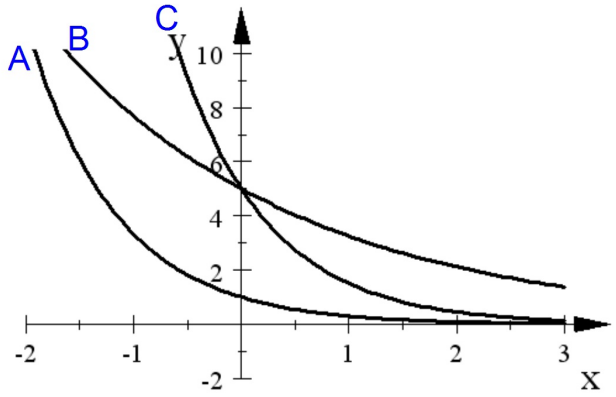
Match each equation to it's graph

1. $y = 3^x$ C
2. $y = 4 \cdot 3^x$ B
3. $y = 4 \cdot 8^x$ A



Match each equation to it's graph

1. $y = (0.3)^x$ A
2. $y = 5(0.3)^x$ C
3. $y = 5(0.65)^x$ B



You can now finish Hwk #13

Practice Sheet Sec 8-7

Due Monday, April 4

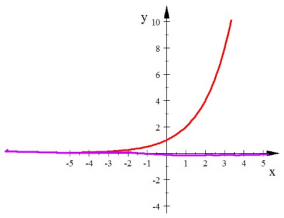
Exponential graphs flatten out the further away from the origin you move.

The horizontal line that the graph gets closer and closer to as you move further from the origin is called the:

Horizontal Asymptote

What is the Horizontal Asymptote for the exponential graphs we've looked at?

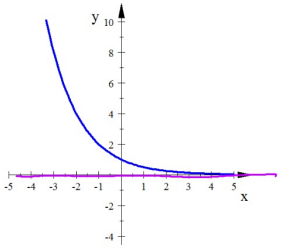
$y = 2^x$



HA: $y = 0$

They both flatten out and get very close to the x-axis

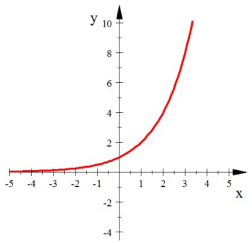
$y = 0.5^x$



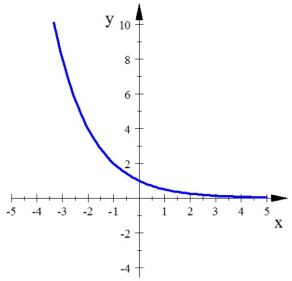
HA: $y = 0$

Do these exponential graphs eventually reach the Horizontal Asymptote y = 0? No, 2^x and 0.5^x will get very small but never become equal to zero.

$y = 2^x$



$y = 0.5^x$



Does each exponential equation represent growth or decay?

1. $y = 4500(0.9983)^x$ DECAY $0 < b < 1$
2. $y = 0.045(1.00201)^x$ GROWTH $b > 1$
3. $y = 7\left(\frac{12}{13}\right)^x$ DECAY $0 < b < 1$
4. $y = 12.06\left(\frac{42}{39}\right)^x$ GROWTH $b > 1$
5. $y = 145(1.33)^{-x}$ $(1.33)^{-x} = \left(\frac{1}{1.33}\right)^x$ DECAY $0 < b < 1$

The sales tax in Michigan is 6%. If you buy an item for $22.50 how much will you have to pay at the cash register?

$22.50(.06) = 1.35$

$22.50 + 1.35 = 23.85$

$100\% + 6\% = 106\%$

$1.06(22.50) = 23.85$

In this week's meet the swimmer lowered her time in the 100 meter free style compared to last week's time by 18%. If she swam the 100 meters in 75 seconds last week what was her time this week?

$75(.18) = 13.5$

$75 - 13.5 = 61.5$ sec

$100\% - 18\% = 82\%$

$.82(75) = 61.5$

Last year the phone you wanted cost $625. This year the price increased 8%. Find the new price.

$100\% + 8\% = 108\%$

$(1.08)(625) = 675$

Last year, 2014 the TV you wanted cost $450. This year the price increased 12%. Find the new price.

$100\% + 12\% = 112\%$

$= (1.12)(450) = 504$

Last year, 2014 the TV you wanted cost $450. This year the price increased 12%. Find the new price.
If each year the price increases 12%, how much will it cost in 2016?

$100 + 12 = 112\%$

$450\ (1.12)\ (112) = 564.48$

2014 2015 2016