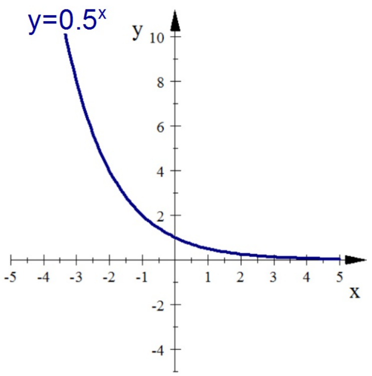
what will this graph look like? $Y_1 = 0.5^x$

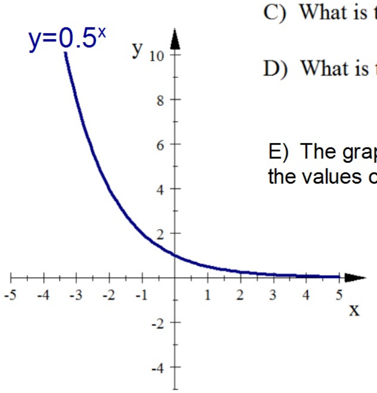


A curve that decreases from left to right. As you move farther to the right the rate of decrease slows.

It starts decreasing very rapidly then slows down.

When $0<b<1$ the graph represents Exponential Decay.

b is called the Decay Factor



C) What is the y-intercept? y-int = 1

D) What is the horizontal asymptote?

y = 0 (x-axis)

E) The graph approaches this horizontal asymptote as the values of x Increase

Graph $Y_1=0.5^x$

Then graph $y=b^x$ for two other values of b between 0 and 1 in Y_2 and Y_3 .

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

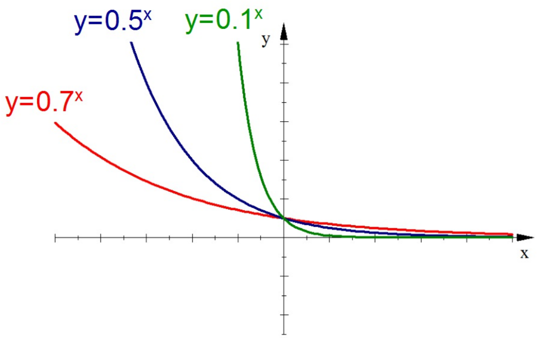
see graphs on next page

2. Describe what different values of b, when $0<b<1$, does to the graph.

see answer on next page

For Exponential Decay:

As b gets smaller, but still positive, the graph decreases faster ("steeper")



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

a: the y-intercept. If a is negative graph is upside down (x-axis reflection)

b: Growth or Decay Factor

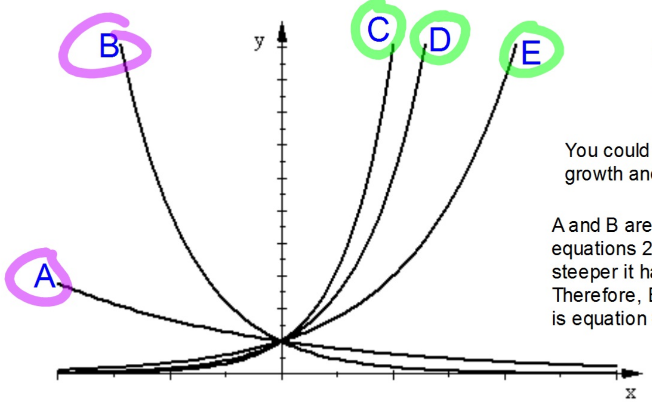
Growth Factor: The larger the value of b the faster the graph increases.
$b>1$

Decay Factor: The smaller the value of b the faster the graph decreases
$0<b<1$

As an alternative, the statement below is true regardless if it's about growth or decay:
For both growth and decay, the closer b is to 1, the flatter the graph is.

1 D $y = 6^x$ 2 B $y = 0.5^x$ 3 A $y = 0.8^x$ 4 C $y = 10^x$

5 E $y = 2^x$



You could first separate them into growth and decay.

A and B are decay so they must be equations 2 and 3. Since B is steeper it has the smaller base. Therefore, B is equation #2 and A is equation #3.

The remaining graphs C, D, and E are all growth. Since C is the steepest it must have the largest base. Since E is the flattest is must have the smallest base. Therefore, C is equation #4 and E is equation #5. That leaves D for equation #1.

Find the value of x in each equation:
Round to the nearest hundredth when needed.

1. $12x = 600$
$\frac{12x}{12} = \frac{600}{12}$
$x = 50$

2. $\sqrt[3]{64} = \sqrt[3]{x^3}$
$x = 4$

3. $10^5 = x$
$10^5 = 100,000$
$x = 100,000$

4. $10^x = 200$

Unless you've seen this type of problem before you don't know how to solve this. But, you could give an estimate of the answer:

$10^2 = 100$ and $10^3 = 1000$

because 200 is between 100 and 1000, 10^x must be between 10^2 and 10^3, probably closer to 10^2. Therefore, x is between 2 and 3, probably closer to 2.

Every math operation has it's inverse.

Inverse operations "undo" each other.

We solve equations by using inverses to get the variable by itself.

Given Operation	Inverse Operation
Addition	Subtraction
Division	Multiplication
Squaring	Square Root
Cube Root	Cubing

Find the equation of the inverse for this function:

$$y = \sqrt{\frac{4x^3 - 7}{8}} + 1$$

STEP 1: switch x & y

$$x = \sqrt{\frac{4y^3 - 7}{8}} + 1$$

STEP 2: solve for y

$$y = \sqrt[3]{\frac{8(x-1)^2 + 7}{4}}$$

Find the equation of the inverse.

$$y = 10^x$$

$$x = 10^y$$

At this point, unless you've seen this before, you don't know how to finish solving for y. There is a way to solve for y, but it's a new function to you.

To solve for x in an exponential equation, such as $y = 10^x$ we use the inverse of an exponential equation called a:

Logarithm

Sec 8-3: Logarithms

(the inverse of exponential functions)

Exponential Function

$$y = b^x$$

The base of the Exponential Function

The exponent

Logarithmic Function

$$\log_b y = x$$

The base of the Logarithmic Function

Exponential Function:

How do you say this?

$$y = b^x$$

"y equals b to the power of x"

Logarithmic Function:

How do you say this?

$$\log_b y = x$$

"Log base b of y equals x"

Exponential Function:

$$y = b^x$$

Logarithmic Function:

$$\log_b y = x$$

"the base is the base"

The exponent is the answer

Another way to remember Logarithmic Form:

Exponential Form: $x = y^z$ becomes Lograrithmic Form: $z = \text{Log}_y x$

Exponential Equation

$y = b^x$

Range: $y>0$

Domain: Any real number

$b>0,\ b\neq1$

Logarithmic Equation

$\log_b y = x$

Range: Any real number

Domain: Pos #'s

b: $b>0,\ b\neq1$

Rewrite each into logarithmic form.

1. $5^x = 40$ → $\log_5 40 = x$

2.

3.