Warm Up

State the percent of increase or decrease of each:

1) $y = 6(1.12)^x$ $1.12 - 1$ ↑ 12%

2) $y = 5(0.67)^x$ $.67 - 1 = -.33$ ↓ 33%

3) The student enrollment at EHS in 1990 was 720 and increased 2.6% each year up until now. If the rate continues at 2.6% per year, what is the expected student enrollment for 2020.

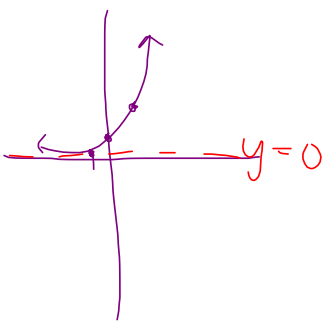
$y = ab^x$ $b = 1 + r$ $1 + .026$ $y = 720(1.026)^{30}$ 1556

Graph the following, without a calculator:

4) $y = 3^x$

Without a calculator, try to graph $y = 3^x + 4$

x	y
-1	1/3
0	1
1	3



(20) $\log_5(-25)$

$5^x = -25$

$5^{-5} = \frac{1}{5^5}$

x	y
-1	
0	
1	

5^x

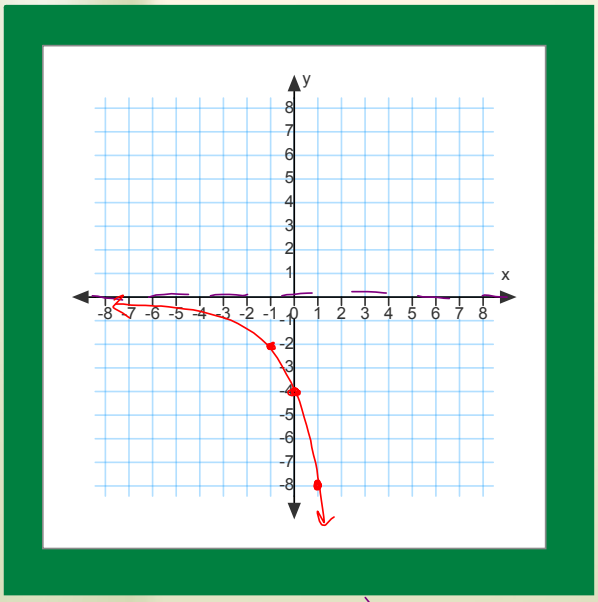
x	y
	-1
	0
	1

$\log_5 x$

8.2 Properties of Exponential Functions

Let's graph $y = -4(2)^x$

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



Do you remember...

D: $(-\infty, \infty)$

R: $(-\infty, 0)$

expon.

$y = 3(2)^x$

D: $(-\infty, \infty)$

logs

$y = \log_5 x$

D: $(0, \infty)$

Translating $y = ab^x$

$y = ab^{x-h}$

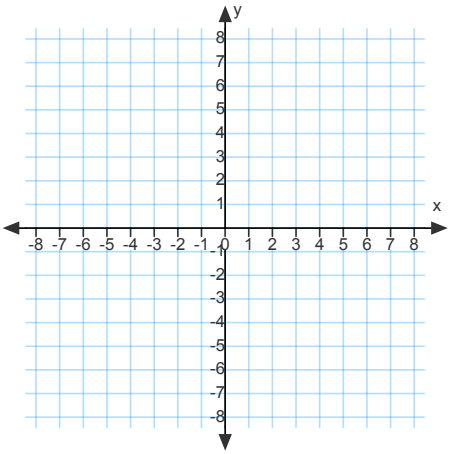
is a horizontal shift

$-h$ Right $+h$ left

$y = ab^x + k$

is a vertical shift

$+k$ up $-k$ down



$y = 2(3)^x$

left 4

up 2

Graph the stretch first of $y = 6\left(\frac{1}{3}\right)^x$

then graph $y = 6\left(\frac{1}{3}\right)^{x-3} - 4$

Pull

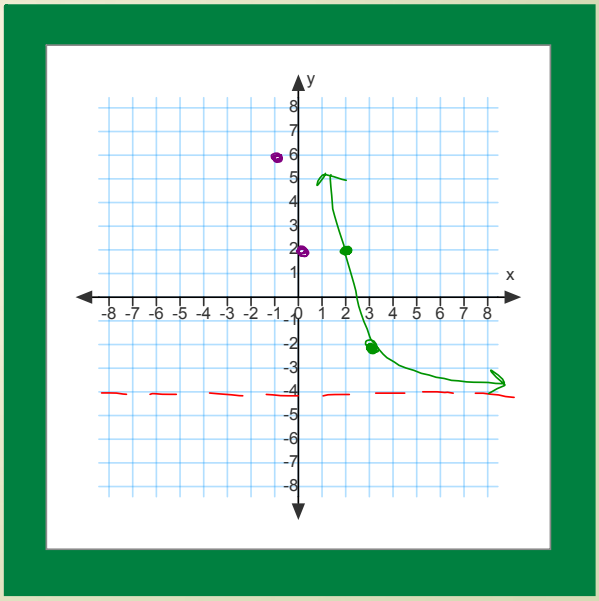
Pull

Pull

① $y = 6\left(\frac{1}{3}\right)^x$

x	y
-1	18
0	6
1	2

② Right 3
Down 4

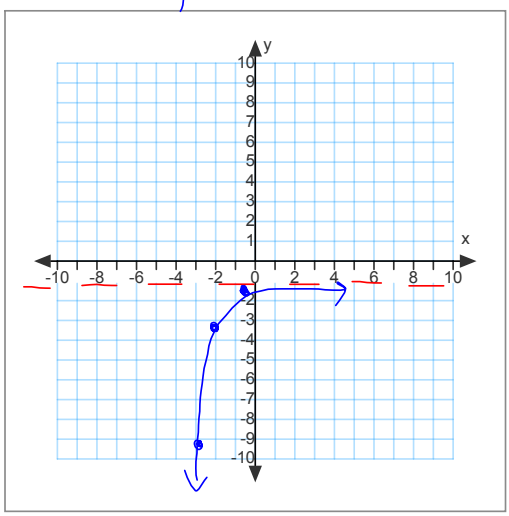


$y = -2\left(\frac{1}{4}\right)^{x+2} - 1$

x	y
-1	-8
0	-2
1	-1/2

$-2 \cdot \frac{1}{4}$ $\left(\frac{1}{4}\right)^1$

$\left(\frac{1}{4}\right)^{-1} = 4$



The number e

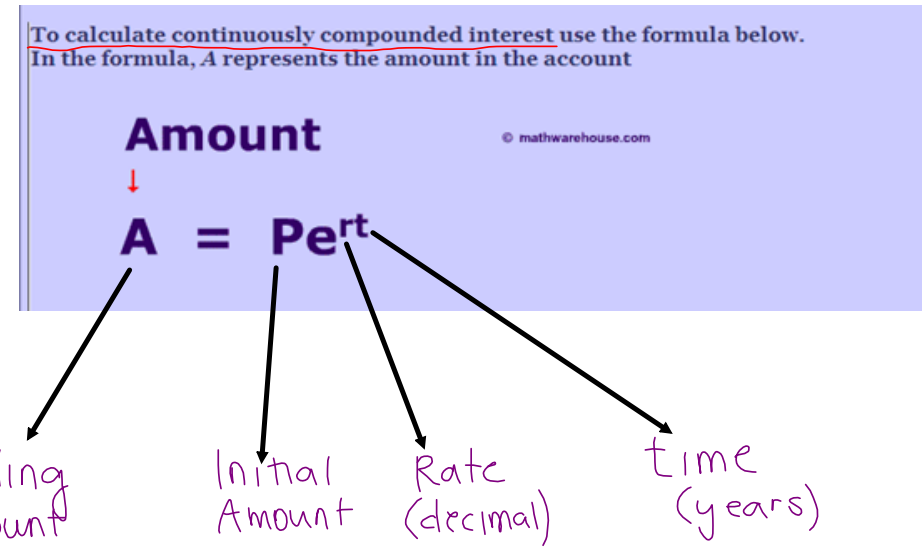
$e \approx 2.7$

Exponential functions with a base of e are useful for describing continuous growth or decay.

Use the graph of $y = e^x$ to evaluate the expression to four decimal places.

$y = e^0$ e^1

$e^3 = 20.0855$


To calculate continuously compounded interest use the formula below.
In the formula, A represents the amount in the account
Amount
© mathwarehouse.com
A = Pe^rt
Ending Amount
Inital Amount
Rate (decimal)
time (years)

Continuously Compounded Interest Formula

$500

compounded countinuously
@ 3.7% → 10 years?

$A = Pe^{rt}$

What in real life is ever continuously compounded ?

Nature doesn't wait for a human year before changing Interest earnings are a type of "growth", but natural phenomena like temperature and radioactive decay change constantly, every second and faster. This is one reason why science equations model change with "e" and not " $(1+r/n)^n$ ":
Nature rudely ignores our calendar when making adjustments.

Without graphing, determine whether each equation represents exponential growth or exponential decay.

$e \approx 2.7$

$f(x) = 3e^x$ Growth

$y = -4\left(\frac{e}{2}\right)^x$ Growth

$f(x) = \left(\frac{1}{e}\right)^x$ Decay

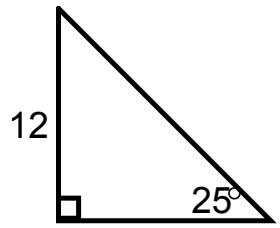
Erase to reveal the answers!

HOMEWORK 8.2

p. 442 #1-11 odd, 19-23 odd, 24-26 all, 30, 36, 42-47 all, 51-53 all

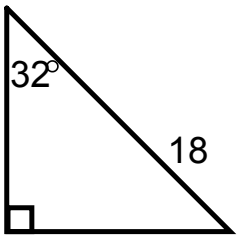
Use your calculator and SOHCAHTOA to find the following.

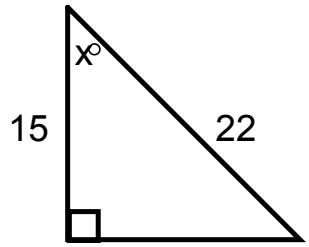
1.



x

2.



x

3.