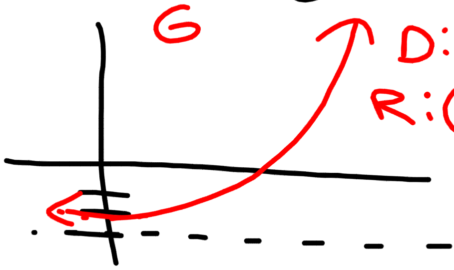
Warm Up

Graph each and state DOMAIN & RANGE & Asymptote
Hint : Determine "Growth" or "Decay" first

$f(x) = (1/2)(2)^{x-1} - 3$

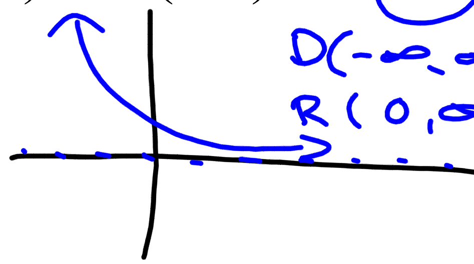
G



D: $(-\infty, \infty)$
R: $(-3, \infty)$

$f(x) = 2\,(1/4)^{x-1}$

D



D $(-\infty, \infty)$
R $(0, \infty)$

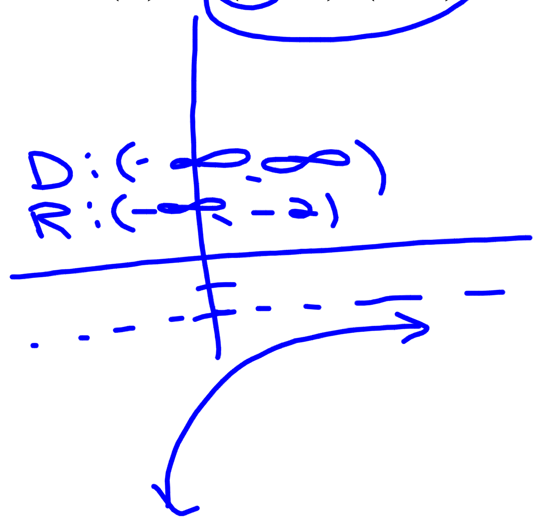
$f(x) = -3^{x} + 2$

G

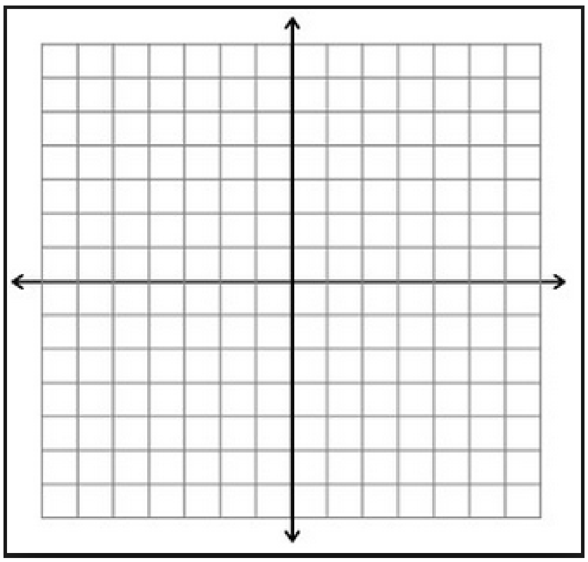
D: $(-\infty, \infty)$
R: $(-\infty, 2)$

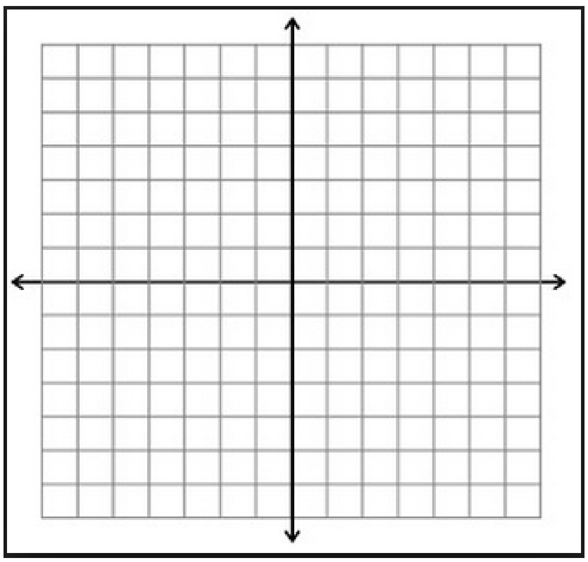
$f(x) = (-1/2)\,(1/3)^{x} - 2$

D



D: $(-\infty, \infty)$
R: $(-\infty, -2)$





7.1 & 7.2 Graphing Exponential Growth & Decay Functions

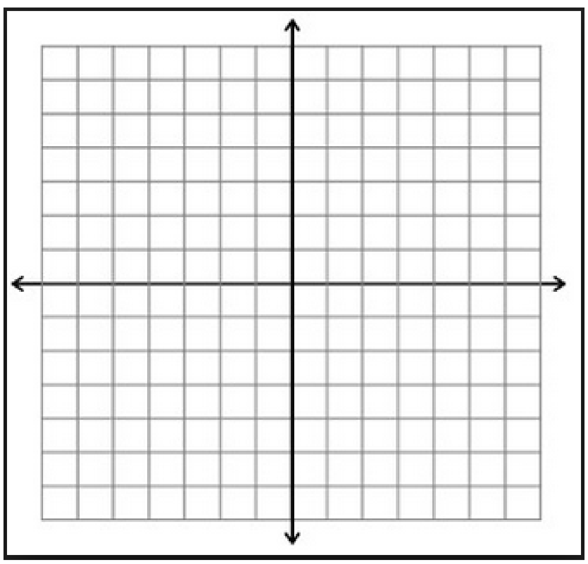
GUIDED PRACTICE for Examples 3 and 4

Graph the function. State the domain and range.

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

5. $y = 5\left(\frac{2}{3}\right)^{x+1} - 2$

6. $g(x) = -3\left(\frac{3}{4}\right)^{x-5} + 4$



Homework Questions

$a\, b^{x-h} + k$

$$y = 3(.4)^{\frac{x-2}{5}} - 1$$

-

a a changes to 4

DLT

What is number "e"?

https://www.youtube.com/watch?v=R0oUeLQIbIk

7.3 Use Functions with The number "e"

$(1 + 1/n)^n$

KEY CONCEPT *For Your Notebook*

The Natural Base *e*

The natural base e is irrational. It is defined as follows:

As n approaches $+\infty$, $\left(1 + \frac{1}{n}\right)^n$ approaches $e \approx 2.718281828$.

The history of mathematics is marked by the discovery of special numbers such as π and i. Another special number is denoted by the letter e. The number is called the **natural base *e*** or the *Euler number* after its discoverer, Leonhard Euler (1707–1783). The expression $\left(1 + \dfrac{1}{n}\right)^n$ approaches e as n increases.

Let's graph e

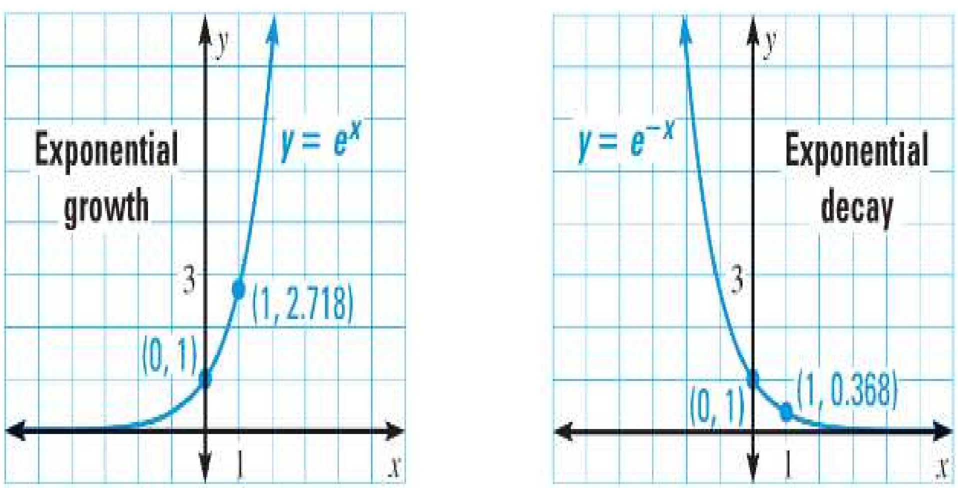
Natural Base Functions

$y = ae^{rx}$

A function of the form $y = ae^{rx}$ is called a *natural base exponential function*.

- If $a > 0$ and $r > 0$, the function is an exponential growth function.
- If $a > 0$ and $r < 0$, the function is an exponential decay function.

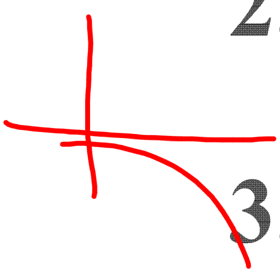
The graphs of the basic functions $y = e^{x}$ and $y = e^{-x}$ are shown below.



growth or decay?

1. $f(x) = 3/5\ e^{x}$ G

2. $g(x) = -3/6\ e^{x}$ G



3. $g(x) = 2\ e^{-x}$ D

4. $f(x) = -3\ e^{-x}$ D

Review

*Exponent Rules

$x^7 \, x^5$

x^{12}

$$\frac{x^3}{x^2}$$

x^1

x^{-4} $\frac{1}{x^4}$

Simplify

1. e^3e^1

e^4

2. $\frac{e^5}{e^2}$ e^3

3. e^{-3} $\frac{1}{e^3}$

TOYO Simplify

1. $e^{15}e^{-10} = e^5$

2. $5e^{-2x}$ $\frac{5}{e^{2x}}$

3. $(2e)^{-3}$

$\frac{1}{(2e)^3}$

$\boxed{\frac{1}{8e^3}}$

13 17 12 18

1 9

7

20 **Count to 20!**

8 6

11

19 15

2 3 5 4

14 16 10

Points

1 point for each addition used in an equation ~~25~~

2 points for each subtraction used in an equation

3 points for each multiplication used in an equation

4 points for each division used in an equation 75

* only use numbers 3 times

0 1 2 3 4 5 6 7 8 9

Can you make it?

$\boxed{1}$ $\boxed{2}$ $\boxed{3}$ $\boxed{4}$ $\boxed{5}$ $\boxed{6}$ $\boxed{7}$

$\boxed{8}$ $\boxed{9}$ $\boxed{0}$

Can you make 25 ?

using-

Can you make it?

1 2 3 4 5 6 7

8 9 0

Can you make 75

using-

Can you make it?

1 2 3 4 5 6 7

8 9 0

Can you make 218

using-

Exponential Models

Growth Model: $y=a(1+r)^t$ ← time

ending amount

starting amount

rate

Decay Model: $y=a(1-r)^t$

principal

rate

Time

Continuously Compounded: $A = Pe^{rt}$

Compound Interest: $A = P(1+\frac{r}{n})^{nt}$

quaterly = 4

how many times per year

monthly = 12

weekly = 52

daily = 365

FORMULAS FOR WORD PROBLEMS

EXPONENTIAL GROWTH MODELS When a real-life quantity increases by a fixed percent each year (or other time period), the amount y of the quantity after t years can be modeled by the equation

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

where a is the initial amount and r is the percent increase expressed as a decimal. Note that the quantity $1 + r$ is the growth factor.

EXPONENTIAL DECAY MODELS When a real-life quantity decreases by a fixed percent each year (or other time period), the amount y of the quantity after t years can be modeled by the equation

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

where a is the initial amount and r is the percent decrease expressed as a decimal. Note that the quantity $1 - r$ is the decay factor.

Compound Interest Formula - where P is the principle deposited, an at annual rate (r), compounded (n) times per year, and t is the time. A is the amount in the account at the end of the time period.

$$A = P(1 + \frac{r}{n})^{nt}$$

Compounded Continuously Formula where A is the amount after t years at r the interest rate

$$A = Pe^{rt}$$

.037

1) You deposit $15,000 in an account earning 3.7% interest compounded for 5 years. How much will you have if its

a. Compounded monthly $A = P\left(1+\frac{r}{n}\right)^{nt}$

b. Continuously compounded

$A = Pe^{rt}$

$A = 15{,}000e^{.037(5)}$

$18048.28

$A = 15{,}000\left(1+\frac{.037}{12}\right)^{12(5)}$

$18043.14

2) Your deposit $3000 in an account that pays 3.5% annual interest compounded continuously. What is the balance after 3 years?

3) The car you bought for $5500 depreciates 10% each year. How much will it be worth in 3 years?

$$Y = a(1-r)^t$$

$$Y = 5500(1-.10)^3$$

\$4009.50

Due Monday: Extra Practice ACT
Due Thursday: Unit Plan Day 2 and WP WS

Classwork: Word Problem WS
Homework: *Look on unit Plan
*Quiz .... !!!!

(graphing and word problems)