Warm Up

Carbon-14 has a half-life of 5750 years. How long will it take for 80% of a 40g sample to decay? 13 351 years

(x) t	0	5750
(y) g	40	20

$\times \frac{1}{2}$

$y = 40\left(\frac{1}{2}\right)^{\frac{x}{5750}}$

How much Remains

IF 80% has decayed, 20% Remains..

$M = 0.20(40)$

$= 8g$

$8 = 40\left(\frac{1}{2}\right)^{\frac{x}{5750}}$

$\frac{8}{40} = \left(\frac{1}{2}\right)^{\frac{x}{5750}}$

$\log 0.2 = \log\left(\frac{1}{2}\right)^{\frac{x}{5750}}$

$\log 0.2 = \frac{x}{5750}\log\left(\frac{1}{2}\right)$

$x = \frac{5750\log(0.2)}{\log\left(\frac{1}{2}\right)}$

$x \doteq 13351$ years

The strongest earthquake recorded in the Miramichi area registered 5.1 on the Richter Scale. What would an earthquake with three times the intensity measure on the Richter Scale? 5.6

$R = \log\left(\frac{I}{10^{-4}}\right)$

$5.1 = \log\left(\frac{I}{10^{-4}}\right)$

$10^{5.1} = \frac{I}{10^{-4}}$

$I = 10^{5.1} \cdot 10^{-4}$

$I = 10^{1.1}$

3 times $I = 3(10)^{1.1} \Rightarrow R = \log\left(\frac{3(10)^{1.1}}{10^{-4}}\right)$

$R = 5.6$

Exponential Growth Review

1. Exponent Laws $(3\omega^3)^3$

2. Exponential Equations
   - Common Bases
   - Substitution $3^{2x} - 4(3^x) - 8 = 0$

3. Exponential Functions
   - Transformations

4. Exponential Applications

5. Logarithms
   - Switch Forms
   - 3 Properties

6. Laws of Logarithms

7. Logarithm Applications
   - Exponential Equations
   - Richter Scale
   - Sound

Review of Exponentials...

- Laws of exponents
  - simplify
  - evaluate

- Solving Exponential Equations
  (1) Same base using laws of exponents
  (2) Set exponents equal and solve equation

  NOTE: "Substitution method" when adding/subtracting

- Exponential Functions

Function Notation (Standard Form)

notice coefficient of x must be 1 to identify horizontal stretch

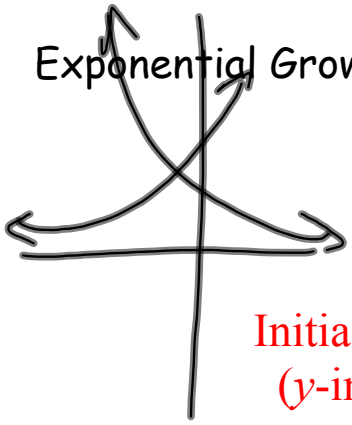
$$y = ab^{\frac{1}{c}(x+h)} + k$$

Mapping Notation - (with respect to $y = b^x$)

$$(x, y) \rightarrow (cx - h, ay + k)$$

where: a = vertical stretch factor
b = base (common ratio)
c = horizontal stretch factor
h = horizontal translation
k = vertical translation

- Exponential Growth/Decay Applications



$$y = a(b)^{\frac{x}{c}}$$

Initial Amount (y-intercept)

Base

Increment (x scale)

- finding the base... (1) Through key words
  (2) Common ratio
  (3) Percent

Review of Logarithms…

Switching Forms:

$$\log_a x = y \Leftrightarrow a^y = x$$

General Properties of Logarithms:

If $a > 0$ and $a \neq 1$, then…

(i) $\log_a 1 = 0$

(ii) $\log_a a^x = x$

(iii) $a^{\log_a x} = x$

1) Product Law → the logarithm of a product is equal to the sum of the logarithms of the factors.

$$\log_a (MN) = \log_a M + \log_a N$$

2) Quotient Law → the logarithm of a quotient is equal to the logarithm of the numerator minus the logarithm of the denominator.

$$\log_a \left(\frac{M}{N}\right) = \log_a M - \log_a N$$

$$\log_a \left(\frac{1}{N}\right) = -\log_a N$$

3) Law of Logarithms for Powers → the logarithm of a power of a number is equal to the exponent multiplied by the logarithm of the number

$$\log_a M^p = p \times \log_a M$$

$$\log_a M^{\frac{p}{q}} = \frac{p}{q} \times \log_a M$$

Solving Logarithmic Equations

STEPS… (1) Write left side & right side as a single logarithm

NOTE: $\log_a a = 1$

(2) Set arguments equal & solve the equation

- Solving exponential equations where both sides can not be expressed to a common base…

  Take the log of both sides of equation and apply laws of logarithms

- Change of base formula: $\log_b N = \dfrac{\log_a N}{\log_a b}$

Review Time!!! Test is on Thursday

Worksheet - Review of Logarithms.doc

Textbook has an excellent
review at end of chapter...
Page 199 - 204

Detailed solutions from textbook

Attachments

Practice Solns - Exponentials.doc

Worksheet - Review of Logarithms.doc