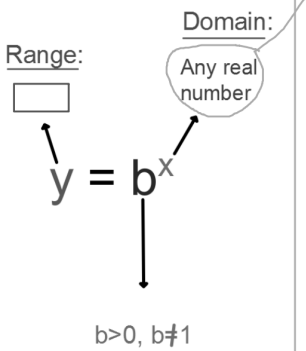
Exponential Equation



Since the exponent of an exponential equation can be any real number, when you are solving for the exponent you won't have to worry about getting extraneous solutions. But checking your answer to make sure you didn't make a mistake is always a good idea.

Solving Exponential Equations:

1. Isolate the exponential (b^x)
2. Change to a Logarithm
3. Solve for x, if necessary.

Solve. $9 + 3(11)^{2x+5} = 45$

$-9 \qquad -9$

$\frac{3(11)^{2x+5}}{3} = \frac{36}{3}$

$11^{2x+5} = 12$

$\log_{11} 12 = 2x+5$

$\left(\frac{\log 12}{\log 11} - 2\right) \div 5 = -1.98$

Solving Logarithmic Equations:

1. Combine more than one log into a single log using the properties of logs
2. Isolate the logarithm
3. Change to an exponential
4. Solve for x, if necessary

Exponential Equation

Range: $y>0$

Domain: Any real number

$y = b^x$

$b>0, b\neq 1$

Logarithmic Equation

$\log_b y = x$

Range:

Domain: $x > 0$

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

Restrictions on Log eg's

You can't:

- have a base of a logarithm that is negative (or 0 or 1)
- take the logarithm of a negative number.

Solve each logarithmic equation

1. $2\log_5 x - 9 = 15$

$\frac{2\log_5 x}{2} = \frac{24}{2}$

$\log_5 x = 12$

$5^{12} = x$

$x = 244,140,625$

1. $2\log_5 x - 9 = 15$

$+9 \quad +9$

$2\log_5 x = 24$

$\log_5 x^2 = 24$

$\sqrt{5^{24}} = \sqrt{x^2}$

$x = 244,140,625$

2. $\log_4(x+6) - \log_4 x = 3$

$\log_4 \frac{x+6}{x} = 3$

$4^3 = \frac{x+6}{x}$

$x \cdot 64 = \frac{x+6}{x} \cdot x$

$64x = x+6$

$-x \quad -x$

$\frac{63x}{63} = \frac{6}{63}$

$x = \frac{6}{63} = \frac{2}{21}$

3. $\log 4x + \log x = 2$

$\log 4x \cdot x = 2$

$\log 4x^2 = 2$

$10^2 = 4x^2$

$\frac{100}{4} = \frac{4x^2}{4}$

$\sqrt{25} = \sqrt{x^2}$

$x = \pm 5$

$x = 5$

-5 is an extraneous sol.

4. $\frac{1}{3}\log_2 x + \log_2 5 = 4$

$\log_2(\sqrt[3]{x} \cdot 5) = 4$

$2^4 = 5\sqrt[3]{x}$

$\frac{16}{5} = \frac{5\sqrt[3]{x}}{5}$

$(3.2)^3 = (\sqrt[3]{x})^3$

$32.768 = x$

4. $3\left(\frac{1}{3}\log_2 x + \log_2 5 = 4\right)$

mult both sides by 3

$\log_2 x + 3\log_2 5 = 12$

$\log_2 x \cdot 125 = 12$

$\frac{2^{12}}{125} = \frac{125x}{125}$

$x = 32.768$

5. $\text{Log}_6(x-5) = 2 - \text{Log}_6 x$

$\text{Log}_6(x-5) + \log_6 x = 2$

$\log_6(x-5)x = 2$

$6^2 = x(x-5)$

$36 = x^2 - 5x$

$-36 \quad -36$

$0 = x^2 - 5x - 36$

$0 = (x-9)(x+4)$

$x = 9, -4$ ← extraneous sol

-36, -9, 4, -5

You can now finish Hwk #27 Sec 8-5

Page 464 Due tomorrow

Problems 8, 11, 37, 38, 44, 47, 82, 83

This is the end of Chapter 8!!!!

Chapter 8 Test will be.....

Monday

What does it mean if something is Periodic?

Merriam-Webster SINCE 1828

Definition of PERIODIC

1 **a** : occurring or recurring at regular intervals

b : occurring repeatedly from time to time

2 **a** : consisting of or containing a series of repeated stages, processes, or digits : CYCLIC • *periodic* decimals • a *periodic* vibration

b : being a function any value of which recurs at regular intervals

Section 13-1: Periodic Functions

What you should be able to do after this section:

- Tell if a function is periodic or not.
- Identify a cycle
- Find the following of periodic functions:
  - Period
  - Amplitude
  - Equation of the Midline(Axis)