U6D3- Exponential Equations Part 1

Tuesday, December 5, 2017 10:57 AM

Unit 6
lesson 3-T...

MAP 4CI : Unit 6 Algebraic Models
Lesson 3 – Exponential Equations Part 1

Definition of an Exponential Equation: An equation that contains the variable in the exponent:

Example $2^x = 32$

To solve the equation you must find a value of "x" that makes this equation true

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Methods to Solve

1. Common Base: look for a common base on both sides of the equation and solve for the unknown.

2. Systematic Trial: start with an estimate and using an iterative process continue to improve the estimated answer.

3. Graphing: Graph the relationship and estimate the answer from the graph.

4. Logarithms: Use logarithms to determine the exact answer (not covered in this course).

Method #1 : Common Base

Looking for a common base:

Express each number as a power

a. 8 as a power of 2.

$2^{?} = 8$

$2^{3} = 8$

b. 81 as a power of 9

$81 = 9^{2}$

c. 81 as a power of 3

$3^{3} = 27$ ✗

$3^{5} = 243$ ✗

$81 = 3^{4}$

d. 0.25 as a power of 2

↑ fraction ⇒ ↗ negative exponent

trial and error

$2^{-2} = 0.25$

note: 2^{-2}

$= \frac{1}{2^{2}}$

$= \frac{1}{4}$

$= 0.25$

Using a common base to solve exponential equations

- **Step 1 – find common base on both sides of equation.**
- **Step 2 – set exponents equal to each other and solve.**

Solve the following exponential equations

a. $3^x = 3^7$

$x = 7$

b. $2^x = 32$

$2^x = 2^5$ ↙ write 32 as a power of 2

note: $2^5 = 32$

$\therefore x = 5$

c. $7^{3x-4} = 49$

$7^{3x-4} = 7^2$ ↙ set exponents equal.

$3x - 4 = 2$ ↓ solve for x

$3x = 6$

$\boxed{x = 2}$

d. $9^{2x-1} = 27^{3x}$

* cannot write 27 as a power of 9.

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

$9 = 3^2$ ↑ $27 = 3^3$ ↑

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

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

$3^{4x-2} = 3^{9x}$

* HW Pages 365-367 #1-7, 10 *

$4x - 2 = 9x$

$-2 = 9x - 4x$

$-2 = 5x$ ↷ $-\frac{2}{5} = x$