

Solving Exponential and Logarithmic Equations Video Lecture

Sections 12.3 and 12.7

Course Learning Objective:

- 1) Solve certain types of exponential and logarithmic equations.**
- 2) Demonstrate appropriate manipulation of exponential and logarithmic expressions.**

Weekly Learning Objectives:

- 1) Solve equations of the form $b^x = b^y$.**
- 2) Solve exponential equations.**
- 3) Solve logarithmic equations.**

Solving Exponential and Logarithmic Equations

How to solve exponential equations of the form $b^x = b^y$

- 1) Each side must have the same base. If the two sides of the equation do not have the same base, change them to the same base if possible.
- 2) Simplify exponents using laws of exponents.
- 3) Set exponents equal to each other.
- 4) Solve the resulting equation.

$$64^x = 16$$

$$9^{2x+1} = 81$$

$$\frac{1}{27} = 3^{2x}$$

$$32^{2x-3} = 2$$

$$\frac{1}{4} = 2^{3x}$$

$$81^{x-1} = 27^{2x}$$

How to solve exponential equations if the bases are different:

- 1) Undo the exponential by taking the common logarithm (log) or natural logarithm (ln) of both sides.
- 2) Simplify the resulting equation.

$$e^{3x} = 5$$

$$5^{2x-6} = 12$$

$$e^{-x+2} = 10$$

$$2^{3x+1} = 5^{x-2}$$

How to solve logarithmic equations:

- 1) Use properties of logarithms to write equation as an isolated single logarithm
- 2) Change logarithm to exponential form
- 3) Solve resulting equation
- 4) Spot check the possible solutions

$$\log_5 (12x - 8) = 3$$

$$\log_4 (y - 3)^2 = 3$$

$$\ln 3 + \ln(x-1) = 0$$

$$\log_3 x + \log_3(x-8) = 2$$

$$\log_2 x - \log_2(3x+5) = 4$$