

Solving Exponential Equations

① isolate exponential term

② switch to log form

OR

take the natural log of each side

③ use logarithmic properties

④ solve for variable

Examples

① $4^x = 15$ ^{exponential term}

$$\log_4 15 = x$$

put in calc

$$x = 1.953$$

$$\ln 4^x = \ln 15$$

$$\ln 4 = \ln 15$$

$$\frac{x \ln 4}{\ln 4} = \frac{\ln 15}{\ln 4}$$

$$x = \frac{\ln 15}{\ln 4} = 1.953$$

② $40e^{0.6x} = 240$ (exp. term)

$e^{0.6x} = 6$

$\ln e^{0.6x} = \ln 6$

$0.6x \ln e = \ln 6$

$0.6x = \frac{\ln 6}{0.6}$

$X = \frac{\ln 6}{0.6} = 2.986$

③ $5^{4x-7} - 3 = 10$ (exp. term)

$5^{4x-7} = 13$

$\ln 5^{4x-7} = \ln 13$

$(4x-7) \ln 5 = \ln 13$

$4x-7 = \frac{\ln 13}{\ln 5} + 7$

$4x = \frac{\ln 13}{\ln 5} + 7$

$X = \frac{\log_5(13) + 7}{4} = 2.148$

$X = \left(\frac{\ln 13}{\ln 5} + 7 \right) \div 4$

$$\textcircled{4} \ln 3^{2x-3} = \ln 7^{3x+2}$$

$$(2x-3)\ln 3 = (3x+2)\ln 7$$

$$2x\ln 3 - 3\ln 3 = 3x\ln 7 + 2\ln 7$$

$$-3x\ln 7 + 3\ln 3 - 3x\ln 7 + 3\ln 3$$

$$2x\ln 3 - 3x\ln 7 = 2\ln 7 + 3\ln 3$$

$$x(2\ln 3 - 3\ln 7) = \frac{2\ln 7 + 3\ln 3}{2\ln 3 - 3\ln 7}$$

$$x = \frac{(2\ln 7 + 3\ln 3)}{(2\ln 3 - 3\ln 7)} = -1.974$$