Exponential and Logarithmic Equations

Exponential Equations

An **exponential equation** is an equation containing a variable in an exponent (ex: $2^x = 4$).

Ex 1.

Solve: $5^{3x-6} = 125$

Ex 2.

Solve: $4^x = 32$

Sometimes, we can't get a common base. In those cases, we can use logarithms.

Ex 3.

Solve: $5^x = 134$

Logarithmic Equations

A **logarithmic equation** is an equation containing a variable in a logarithm (ex: $\log x = 2$)

Ex 4.

Solve: $\log_2(x - 4) = 3$

Ex 5.

Solve: $4\ln(3x) = 8$

Note: If you use one of the 3 properties of logarithms from 9.4, then you **must check your solutions**!

Ex 6.

Solve: $\log x + \log(x - 3) = 1$

Ex 7.

Solve: $\ln(x + 2) - \ln(4x + 3) = \ln\left(\frac{1}{x}\right)$

Practice

1. Solve.

a) $9^{x+1} = 243$

b) $5^{x-3} = 137$

c) $9e^x = 99$

d) $\log_5 x = 3$

e) $6 \ln(2x) = 30$

f) $\log_2(x-1) + \log_2(x+1) = 3$

g) $\log(2x-1) = \log(x+3) + \log 3$ (Hint: combine RHS into a single logarithm first)

h) $\log(x+7) - \log 3 = \log(7x+1)$ (Hint: combine LHS into a single logarithm first)

Q: A woman shoots her husband. Then she holds him under water for over 5 minutes. Finally, she hangs him. But 5 minutes later they both go out together and enjoy a wonderful dinner together. How can this be?