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Lesson 4.5: Exponential & Logarithmic Equations

Exponential Equations

Guidelines for Solving Exponential Equations:

Step 1:	Isolate the exponential expression on one side of the equation.
Step 2:	Take the logarithm of each side of the equation. Then, use Laws of Logarithms to "bring down" the exponent.
Step 3:	Solve for the variable.

Examples: Solve each equation and round your answer to three decimal places.

1. $3^{x+2} = 9$ **(hint: do you NEED to use log?)**

2. $3^{x+2} = 7$ *Step 1 is not necessary

$\log(3^{x+2}) = \log(7)$

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

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

$-2 \quad -2$

$x = \frac{\log(7)}{\log(3)} - 2 \Rightarrow x \approx -0.229$

3. $8e^{2x} = 20$

4. $e^{3-2x} = 4$

5. $e^{2x} - e^{x} - 6 = 0$ **(hint: think quadratic!)**

$(e^x)^2 - e^x - 6 = 0$

6. $3xe^{x} + x^2e^{x} = 0$ **(hint: factor!)**

Logarithmic Equations

Guidelines for Solving Logarithmic Equations:

Step 1:	Isolate the logarithmic term on one side of the equation; you might first need to combine the logarithmic terms.
Step 2:	Write the equation in exponential form (or raise the base to each side of the equation)
Step 3:	Solve for the variable.

1. $\ln(x) = 8$ * base: e $e^8 = x$	2. $\log_2(25 - x) = 3$
3. $4 + 3\log(2x) = 16$ * base: 10	4. $\log(x + 2) + \log(x - 1) = 1$

Solving Logarithmic Equations Graphically

Example: $x^2 = 2\ln(x + 2)$

1. Move all terms to one side of the equation: $0 = 2\ln(x + 2) - x^2$
2. Then, graph $y = 2\ln(x + 2) - x^2$
3. Finally, the x –intercept(s) on the graph are the solution(s) to the equation.

SOLUTION: