Math 1310
Section 5.5: Solving Exponential and Logarithmic Equations

Our last topic of the semester will be to solve exponential and logarithmic equations.

We'll start with exponential equations. An exponential equation is an equation in which the variable appears in the exponent. To solve these equations, isolate the exponential expression on one side of the equation, then take the logarithm of both sides of the equation to solve for the variable. You can use either natural logarithms or common logarithms. Read the directions carefully, as they may instruct you as to which to use.

Example 1: Solve for x: $5^{3x} = 9$. (a) Give the exact value using natural logarithms. (b) Rewrite the results from part (a) so that each logarithm contains a prime number.

Example 2: Solve for x: $4e^{(x+5)} + 5 = 7$. (a) Give the exact value using natural logarithms. (b) Rewrite the results from part (a) so that each logarithm contains a prime number.

Example 3: Solve for x: $e^{2x} - 9e^{x} + 20 = 0$. (a) Give the exact value using natural logarithms. (b) Rewrite the results from part (a) so that each logarithm contains a prime number.

Example 4: Solve for x: $25^{3x-2} = \frac{1}{(\sqrt{125})^{x}}$ (a) Give the exact value using natural logarithms. (b) Rewrite the results from part (a) so that each logarithm contains a prime number.

An equation in which the logarithm of the variable occurs is called a logarithmic equation. To solve such an equation, isolate the logarithmic expression on one side of the equation. Then write the equation in exponential form and solve for the variable, or use the law of logarithms to simplify and solve for the variable.

Example 5: Solve for *x*: $\log_3(x-4)=2$

Example 6: Solve for *x*: $\log_6(x)+\log_6(x+1)=\log_6 2$

Example 7: Solve for *x*: $\log_6 x+\log_6(5-x)=2$

Example 8: Solve for x: $\ln(x^2 + 4) = 2$