

Log and Exponent Example

Math 130 *Kovitz*

Solve for x and check your answers in the original equation.

$$\log_6(1 - x) + \log_6(6x - 4) = -1.$$

$$\log_6 [(1 - x)(6x - 4)] = -1. \quad \text{The sum of the logs equals the log of the product.}$$

$$\log_6(-6x^2 + 10x - 4) = -1. \quad \text{Using FOIL to expand the product of two binomials.}$$

$$6^{-1} = -6x^2 + 10x - 4. \quad \text{Rewrite a log in exponential form: } \log_a w = p \text{ becomes } a^p = w.$$

$$\frac{1}{6} = -6x^2 + 10x - 4. \quad \text{Using the rule for a negative exponent.}$$

$$1 = -36x^2 + 60x - 24. \quad \text{Clear the fraction by multiplying both sides by 6.}$$

$$36x^2 - 60x + 25 = 0. \quad \text{Get the quadratic in a form with 0 on one side of the equation (since we are not completing the square).}$$

$$(6x - 5)^2 = 0. \quad \text{This equation factors as a perfect square.}$$

$$6x - 5 = 0.$$

$$x = 5/6.$$

$$\text{Check: } \log_6(1 - 5/6) + \log_6 [6(5/6) - 4] = -1.$$

$$\log_6(1/6) + \log_6 1 = -1.$$

$$-1 + 0 = -1, \text{ so it checks.}$$