6.6B Logarithmic Equations

▼ Method of Converting to an Exponential in Symbols and Words

1. Recognize a logarithmic equation with the logarithm on one side.
2. Convert to an exponential equation using the following equivalence.
3. Solve the remaining equation by isolating x.
4. Check the proposed solution in the original equation.

$$y = \log_b x$$
$$b^y = x$$

▼ Examples of Solving Logarithmic Equations

▼ Example 1: $\log_2(1 - 2x) = 3$

▼ Example 2: $\log_5(x + 6) + \log_5(x + 2) = 1$

▼ Example 3: $\log_3 x^2 = 4$

▼ Example 4: $\log_4 x = 3$

▼ Example 5: $\log_5(x-3) = 2$

▼ Example 6: $2\ln x = 8$

▼ Example 7: $\log_2 x + \log_2(x-2) = 3$

▼ Method Using the Property of Equality in Symbols and Words

1. Recognize a logarithmic equation with logarithms of the same base on both sides.
2. Apply the property of equality or one-to-one property which states that if you have logarithms of the same base on both sides the expressions inside the logarithms must be equal.
3. Solve the remaining equation.
4. Check to make sure solutions are in the domain of the logarithms.

$$\log_b u = \log_b v$$
$$u = v$$

▼ Examples of Solving Logarithmic Equations

▼ Example 1: $\log_5(x-4) = \log_5 6$

▼ Example 2: $2\log_5 x = \log_5 9$

▼ Example 3: $\log_3 2 + \log_3(x-3) = \log_3 10$

▼ Example 4: $\log(x+3) + \log(x-2) = \log 14$

▼ Example 5: $\ln x + \ln(x-4) = \ln(x+6)$