Section 5.3 Properties of Logarithms

Objective 1: Using the Product Rule, Quotient Rule, and Power Rule for Logarithms

Let $b > 0$, $b \neq 1$, u and v represent positive numbers, and r be any real number.

1. The Product Rule for Logarithms is $\log_b(uv) = \log_b u + \log_b v$.

2. The Quotient Rule for Logarithms is $\log_b \dfrac{u}{v} = \log_b u - \log_b v$.

3. The Power Rule for Logarithms is $\log_b u^r = r \log_b u$.

$\log_b(u+v)$ is NOT equivalent to $\log_b u + \log_b v$

$\log_b(u-v)$ is NOT equivalent to $\log_b u - \log_b v$

$\dfrac{\log_b u}{\log_b v}$ is NOT equivalent to $\log_b u - \log_b v$

$(\log_b u)^r$ is NOT equivalent to $r \log_b u$

Objective 2: Expanding and Condensing Logarithmic Expressions

 When expanding and condensing logarithmic expressions be sure to look for resulting logarithms that can be evaluated or simplified.

Objective 3: Solving Logarithmic Equations Using the Logarithm Property of Equality

The Logarithm Property of Equality: If a logarithmic equation can be written in the form $\log_b u = \log_b v$, then $u = v$. Furthermore, if $u = v$, then $\log_b u = \log_b v$.

Objective 4: Using the Change of Base Formula

Change of Base Formula: For any positive base $b \neq 1$ and for any positive real number u, then $\log_b u = \dfrac{\log_a u}{\log_a b}$ where a is any positive number such that $a \neq 1$.