Properties of Logarithmic Functions

If b, a, and c are positive real numbers, $b \neq 1$, and n is a real number, then:

1. **Definition:** $\log_b a = c$ if and only if $b^c = a$

2. $\log_b(a \cdot c) = \log_b a + \log_b c$

3. $\log_b \dfrac{a}{c} = \log_b a - \log_b c$

4. $\log_b a^n = n \cdot \log_b a$

5. $\log_b 1 = 0$

6. $\log_b b = 1$

7. $\log_b b^n = n$

8. $b^{\log_b n} = n, \; n > 0$

9. $\log_b a = \log_b c$ if and only if $a = c$

10. **Change of Base:** $\log_b a = \dfrac{\log_c a}{\log_c b} = \dfrac{\log a}{\log b} = \dfrac{\ln a}{\ln b}$