

Section 6.5

Properties of Logarithms

LOGARITHMIC PROPERTIES

1. $\log_a 1 = 0$
2. $\log_a a = 1$
3. $a^{\log_a M} = M$
4. $\log_a a^r = r$
5. $\log_a(MN) = \log_a M + \log_a N$
6. $\log_a\left(\frac{M}{N}\right) = \log_a M - \log_a N$
7. $\log_a(M^r) = r \log_a M$
8. $\log_a\left(\frac{1}{N}\right) = -\log_a N$
9. $\log_a M = \log_a N \Leftrightarrow M = N$

CHANGE OF BASE FORMULA

If M , a , and b are positive real numbers with $a \neq 1$ and $b \neq 1$, then

$$\log_a M = \frac{\log_b M}{\log_b a}$$

In particular, if M and a are positive real numbers and $a \neq 1$, then

$$\log_a M = \frac{\log M}{\log a} = \frac{\ln M}{\ln a}$$