Properties of Logarithms

1. $y = \log_a x \iff x = a^y$

2. $\log_a \frac{1}{a} = -1$

   $\log_a 1 = 0$

   $\log_a a = 1$

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. $\log_a M = \frac{\log_b M}{\log_b a}$ (Change of Base Formula)