# Taylor Series Expansion of log((N+1)/(N-1))

We aim to find the Taylor series expansion of the logarithmic expression:

log((N + 1)/(N - 1))

This can be rewritten as:

log((1 + 1/N) / (1 - 1/N))

Using the known identity for the logarithm of a ratio:

log((1 + x)/(1 - x)) = 2(x + x^3/3 + x^5/5 + ...), for |x| < 1

Set x = 1/N, which is valid for N > 1. Then:

log((N + 1)/(N - 1)) = 2(1/N + 1/(3N^3) + 1/(5N^5) + ...)

Therefore, the Taylor series expansion is:

log((N + 1)/(N - 1)) = 2/N + 2/(3N^3) + 2/(5N^5) + ...

This expansion becomes very accurate for large N.