Here is the example of the famous "alternating harmonic" series and a few of its partial sums.

\[ a := n \rightarrow (\frac{(-1)^{(n+1)}}{n}) \]

\[ s := N \rightarrow \text{evalf} \left( \sum_{n=1}^{N} a(n) \right) \]

\[ s(10) ; \quad \text{evalf} = 0.6456349206 \]
\[ s(100) ; \quad \text{evalf} = 0.6881721793 \]
\[ s(200) ; \quad \text{evalf} = 0.6906534305 \]
\[ s(300) ; \quad \text{evalf} = 0.6914832917 \]
\[ s(500) ; \quad \text{evalf} = 0.6921481806 \]
\[ s(1000) ; \quad \text{evalf} = 0.6926474306 \]

First two digits appear to have stabilized, at least.

\[ s(1001) ; \quad \text{evalf} = 0.6936464316 \]
\[ s(1002) ; \quad \text{evalf} = 0.6926484276 \]
\[ s(1003) ; \quad \text{evalf} = 0.6936454365 \]
\[ s(2000) ; \quad \text{evalf} = 0.6928972431 \]
\[ s(2001) ; \quad \text{evalf} = 0.6933969932 \]

This is a very distinctive pattern that happens with the partial sums of an alternating series.
Use the Alternating Series Test to get an estimate for the sum AND to get an upper bound for the error in the estimate.

\[ s_{est} = \frac{s(2000) + s(2001)}{2}; \]

\[ s_{est} = 0.6931471182 \]

\[ \text{maxerr} = \text{evalf}(a(2001)/2); \]

\[ \text{maxerr} = 0.0002498750625 \]

\[ \text{evalf}(\ln(2)); \]

\[ \text{evalf}(\ln(2)); \]

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\[ \text{evalf}(\ln(2)); \]

This number is certainly smaller than "maxerr". This shows that "maxerr" is an "upper bound" for the error, and that the actual error may in fact be much less than the bound.