

Question

Evaluate the limit

$$\lim_{t \rightarrow \infty} \frac{t^2 + 1}{t \ln(t)}.$$

Answer

This limit has the indeterminate form $\frac{\infty}{\infty}$, and so we apply l'Hopital's rule:

$$\lim_{t \rightarrow \infty} \frac{t^2 + 1}{t \ln(t)} = \lim_{t \rightarrow \infty} \frac{2t}{\ln(t) + 1}.$$

The right-hand limit still has the indeterminate form $\frac{\infty}{\infty}$, and so we may apply l'Hopital's rule again:

$$\lim_{t \rightarrow \infty} \frac{2t}{\ln(t) + 1} = \lim_{t \rightarrow \infty} \frac{2}{\frac{1}{t}} = \lim_{t \rightarrow \infty} 2t = \infty.$$