# Convergence of Products from Sums

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$$\prod_{n=1}^{\infty} a_n :$$

- If $a_n = 0$ for some $n$, all partial products after $n$ are 0: "diverges" to 0
- Otherwise, rewrite all $a_n$ as $s_n \exp(b_n)$, where $s_n = \operatorname{sgn}(a_n) = \pm 1$ and $b_n = \ln |a_n|$. so the product is

$$\left(\prod_{n=1}^{\infty} s_n\right) \exp\left(\sum_{n=1}^{\infty} b_n\right)$$

  - the latter sum is equivalent to

$$\sum_{n=1}^{\infty} (|a_n| - 1)$$