

Frequently Arising Limits of Sequences

1a. $\lim_{k \rightarrow \infty} \frac{1}{k} = 0$

1b. $\lim_{k \rightarrow \infty} \frac{1}{k^p} = 0, p > 0$

2. $\lim_{k \rightarrow \infty} \frac{\ln k}{k} = 0$

3. $\lim_{k \rightarrow \infty} x^{1/k} = 1, x > 0$

4. $\lim_{k \rightarrow \infty} k^{1/k} = 1$

5. $\lim_{k \rightarrow \infty} x^k = 0, -1 < x < 1$

6. $\lim_{k \rightarrow \infty} \frac{x^k}{k!} = 0, -\infty < x < \infty$

7. $\lim_{k \rightarrow \infty} \left(1 + \frac{x}{k}\right)^k = e^x, -\infty < x < \infty$

Catalog of Known Series

Convergent Series

Geometric Series

$$\sum_{k=0}^{\infty} ar^k = \frac{a}{1-r}, -1 < r < 1$$

p-series

$$\sum_{k=1}^{\infty} \frac{1}{k^p}, p > 1$$

q-log series

$$\sum_{k=1}^{\infty} \frac{\ln k}{k^q}, q > 1$$

Exponential Series

$$\sum_{k=0}^{\infty} \frac{x^k}{k!} = e^x, -\infty < x < \infty$$

Divergent Series

Geometric Series

$$\sum_{k=0}^{\infty} ar^k, r \geq 1$$

p-series

$$\sum_{k=1}^{\infty} \frac{1}{k^p}, 0 \leq p \leq 1$$

q-log series

$$\sum_{k=1}^{\infty} \frac{\ln k}{k^q}, 0 \leq q \leq 1$$