

# Identities

Nothing written on this page will be graded.

## Summations

$$\sum_{i=0}^{\infty} x^i = \frac{1}{1-x} \text{ for } |x| < 1$$

$$\sum_{i=0}^{n-1} 1 = \sum_{i=1}^n 1 = n$$

$$\sum_{i=0}^n i = 0 + \sum_{i=1}^n i = \frac{n(n+1)}{2}$$

$$\sum_{i=1}^n i^2 = \frac{n(n+1)(2n+1)}{6} = \frac{n^3}{3} + \frac{n^2}{2} + \frac{n}{6}$$

$$\sum_{i=0}^n i^3 = \left(\frac{n(n+1)}{2}\right)^2 = \frac{n^4}{4} + \frac{n^3}{2} + \frac{n^2}{4}$$

$$\sum_{i=0}^{n-1} x^i = \frac{1-x^n}{1-x}$$

$$\sum_{i=0}^{n-1} \frac{1}{2^i} = 2 - \frac{1}{2^{n-1}}$$

## Logs

$$x^{\log_x(n)} = n$$

$$a^{\log_b(c)} = c^{\log_b(a)}$$

$$\log_b(a) = \frac{\log_d(a)}{\log_d(b)}$$