

Math Formulas: Special Power Series

Powers of Natural Numbers

$$1. \quad \sum_{k=1}^n k = \frac{1}{2}n(n+1)$$

$$2. \quad \sum_{k=1}^n k^2 = \frac{1}{6}n(n+1)(2n+1)$$

$$3. \quad \sum_{k=1}^n k^3 = \frac{1}{4}n^2(n+1)^2$$

Special Power Series

$$4. \quad \frac{1}{1-x} = 1 + x + x^2 + x^3 + \dots \quad (\text{for } -1 < x < 1)$$

$$5. \quad \frac{1}{1+x} = 1 - x + x^2 - x^3 + \dots \quad (\text{for } -1 < x < 1)$$

$$6. \quad e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots$$

$$7. \quad \ln(1+x) = x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \dots \quad (\text{for } -1 < x < 1)$$

$$8. \quad \sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \dots$$

$$9. \quad \cos x = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \dots$$

$$10. \quad \tan x = x - \frac{x^3}{3} + \frac{2x^5}{15} - \frac{17x^7}{315} + \dots \quad \left(\text{for } -\frac{\pi}{2} < x < \frac{\pi}{2}\right)$$

$$11. \quad \sinh x = x + \frac{x^3}{3!} + \frac{x^5}{5!} + \frac{x^7}{7!} + \dots$$

$$12. \quad \cosh x = 1 + \frac{x^2}{2!} + \frac{x^4}{4!} + \frac{x^6}{6!} + \dots$$