

$$(1-x)^{-1} = 1 + x + x^2 + x^3 + \dots$$

$$a^x = 1 + x \log a + \frac{x^2}{2!} (\log a)^2 + \frac{x^3}{3!} (\log a)^3 + \dots$$

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

$$\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \dots$$

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

$$\tan x = x + \frac{x^3}{3} + \frac{2}{15}x^5 + \dots$$

$$\log(1+x) = x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \dots \quad |x| < 1$$

$$\log(1-x) = -\left(x + \frac{x^2}{2} + \frac{x^3}{3} + \frac{x^4}{4} + \dots\right) \quad |x| < 1$$

$$\sin^{-1} x = x + \frac{x^3}{6} + \frac{3x^5}{40} + \dots$$

$$\tan^{-1} x = x - \frac{x^3}{3} + \frac{x^5}{5} - \dots$$

$$\sin hx = x + \frac{x^3}{3!} + \frac{x^5}{5!} + \dots$$

$$\cos hx = 1 + \frac{x^2}{2!} + \frac{x^4}{4!} + \dots$$

**Remember:**  $\log 1 = 0$ ;  $\log e = 1$ ;  $\log \infty = \infty$ ;  $\log 0 = -\infty$

### 2.1.4 Some Useful Results

$$1. \quad \lim_{x \rightarrow 0} \frac{\sin x}{x} = 1$$

$$2. \quad \lim_{x \rightarrow 0} \cos x = 1$$

$$3. \quad \lim_{x \rightarrow 0} \frac{\tan x}{x} = 1$$

$$4. \quad \lim_{x \rightarrow 0} (1+x)^{\frac{1}{x}} = e$$

$$5. \quad \lim_{x \rightarrow 0} (1+nx)^{\frac{1}{x}} = e^n$$

$$6. \quad \lim_{x \rightarrow \infty} \left(1 + \frac{1}{x}\right)^x = e$$

$$7. \quad \lim_{x \rightarrow \infty} \left(1 + \frac{a}{x}\right)^x = e^a$$