

Type $\frac{0}{0}$ (Use L'Hôpital's Rule)

$$\textcircled{1} \quad \lim_{x \rightarrow 1} \frac{\ln x}{\tan \pi x}$$

$$\text{Ans. } \frac{1}{\pi}$$

$$\textcircled{7} \quad \lim_{x \rightarrow 0} \frac{x - \sin x}{x^3}$$

$$\text{Ans. } \frac{1}{6}$$

$$\textcircled{2} \quad \lim_{x \rightarrow \frac{\pi}{2}^-} \frac{\cos x}{\sqrt{\frac{\pi}{2} - x}}$$

$$\text{Ans. } 0$$

$$\textcircled{8} \quad \lim_{x \rightarrow 0} \frac{e^{ax} - e^{bx}}{x}$$

$$\text{Ans. } a - b$$

$$\textcircled{3} \quad \lim_{x \rightarrow 0} \frac{e^x + e^{-x} - 2}{1 - \cos 2x}$$

$$\text{Ans. } \frac{1}{2}$$

$$\textcircled{9} \quad \lim_{x \rightarrow 0} \frac{x - \tan x}{\sin x - x}$$

$$\text{Ans. } 2$$

$$\textcircled{4} \quad \lim_{x \rightarrow \frac{\pi}{2}} \frac{\sin 2x}{4x^2 - \pi^2}$$

$$\text{Ans. } -1/(2\pi)$$

$$\textcircled{10} \quad \lim_{x \rightarrow \infty} \frac{\frac{1}{2}\pi - \tan^{-1} x}{\ln\left(1 + \frac{1}{x^2}\right)}$$

$$\text{Ans. } \infty$$

$$\textcircled{5} \quad \lim_{x \rightarrow 0} \frac{x - \ln(x+1)}{1 - \cos 2x}$$

$$\text{Ans. } \frac{1}{4}$$

$$\textcircled{11} \quad \lim_{x \rightarrow 0^+} \frac{\ln(\cos x)}{\ln(\cos 3x)}$$

$$\text{Ans. } \frac{1}{9}$$

$$\textcircled{6} \quad \lim_{x \rightarrow 0} \frac{2 - x^2 - 2\cos x}{x^4}$$

$$\text{Ans. } -\frac{1}{12}$$

Other Indeterminate Forms

$$\textcircled{1} \lim_{x \rightarrow \infty} x \cdot \ln \left(\frac{x+1}{x-1} \right)$$

Ans. 2

$$\textcircled{8} \lim_{x \rightarrow \frac{\pi}{2}^-} (\tan x)^{\cos x}$$

Ans. 1

$$\textcircled{2} \lim_{x \rightarrow \infty} \frac{x \ln x}{x + \ln x}$$

Ans. ∞

$$\textcircled{9} \lim_{x \rightarrow \infty} (1 + x^2)^{1/\ln x}$$

Ans. e^2

$$\textcircled{3} \lim_{x \rightarrow \infty} x (e^{\sin(2/x)} - 1)$$

Ans. 2

$$\textcircled{10} \lim_{\theta \rightarrow 0} \left(\frac{1}{1 - \cos \theta} - \frac{2}{\sin^2 \theta} \right)$$

Ans. $-\frac{1}{2}$

$$\textcircled{4} \lim_{x \rightarrow \infty} \left(1 + \frac{1}{x^2} \right)^x$$

Ans. 1

$$\textcircled{11} \lim_{x \rightarrow 0^+} \frac{\cot x}{\cot 2x}$$

Ans. 2

$$\textcircled{5} \lim_{x \rightarrow \infty} \left(1 + \frac{1}{x} \right)^{x^2}$$

Ans. ∞

$$\textcircled{6} \lim_{x \rightarrow 0^+} x^{\sin x}$$

Ans. 1

$$\textcircled{7} \lim_{x \rightarrow 0^+} (\sin x)^{3/\ln x}$$

Ans. e^3