

用三次羅比塔法則

$$\begin{aligned} 1. \lim_{x \rightarrow 0} \frac{\tan x - \sin x}{x^3} & \left( \frac{0}{0} \right) \\ & = \lim_{x \rightarrow 0} \frac{\sec^2 x - \cos x}{3x^2} \left( \frac{0}{0} \right) \\ & = \lim_{x \rightarrow 0} \frac{2 \sec x \sec x \tan x + \sin x}{6x} \\ & = \lim_{x \rightarrow 0} \frac{2 \sec^2 x \tan x + \sin x}{6x} \left( \frac{0}{0} \right) \\ & = \lim_{x \rightarrow 0} \frac{2 \sec^4 x + 4 \sec^2 x \tan^2 x + \cos x}{6} \\ & = \frac{1}{2} \end{aligned}$$