Derivatives of the Trigonometric Functions

$D_x[\sin x] = \cos x$

$D_x[\cos x] = -\sin x$

$D_x[\tan x] = \sec^2 x$

$D_x[\cot x] = -\csc^2 x$

$D_x[\sec x] = \sec x \tan x$

$D_x[\csc x] = -\csc x \cot x$

$f(x) = 5\sin x$

$f'(x) = 5\cos x$

$f(x) = \tan x + \cot x$

$f'(x) = \sec^2 x - \csc^2 x$

$g(x) = x^3 \cos x$

$g'(x) = -x^3 \sin x + 3x^2 \cos x$

$g'(x) = (x^3)(-\sin x) + (\cos x)(3x^2)$

$(\cos x)(3x^2)$ $\cancel{\cos 3x^3}$

$\cancel{\cos 3x^3}$

$(\cos x)\,3x^2$

$\sin x + 2$

$2 + \sin x$

$$h(x) = \frac{\sin(x) - 1}{\cos(x) - 1}$$

$$h'(x) = \frac{(\cos(x) - 1)(\cos(x)) - (\sin(x) - 1)(-\sin(x))}{(\cos(x) - 1)^2}$$

$$\lim_{x \to 0} \frac{\sin^2 x}{x}$$

$$\frac{\sin x}{x} \to 1$$

$$= \lim_{x \to 0} \overbrace{\frac{\sin x}{x}}^{1} \sin x = 0$$

$$\lim_{x \to \frac{\pi}{4}} \frac{\sin x}{3x} = \frac{\sin \frac{\pi}{4}}{3 \cdot \frac{\pi}{4}}$$