Derivatives of the Trigonometric Functions

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

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

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

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

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

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

$f(x) = 5\sin x$

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

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

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

$h(x) = x\sin x + \cos x$

$h'(x) = x\cos x + \sin x - \sin x$

$= x\cos x$

$f(x) = 3\sec x \tan x$

$f'(x) = 3\left[\sec x \sec^2 x + \tan x \sec x \tan x\right]$

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

$g'(x) = x^3 \sec^2 x + 3x^2 \tan x$

$= (x^3)(\sec^2 x) + (\tan x)(3x^2)$ $(\tan x)3x^2$ $\tan 3x^3$

$\sin x - 1$

$-1 + \sin x$

$1 + \cos x$

5. $\lim_{x \to \frac{\pi}{4}} \frac{\sin x}{3x}$

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