

Four Trigonometric Derivatives (Notice Product, Quotient, Power, and Constant Rules as well):

(A) $y = \sin x \cos x$ (B)

$$\frac{dy}{dx} = \sin x(-\sin x) + (\cos x)(-\sin x)$$

$$\frac{dy}{dx} = -\sin^2 x + \cos^2 x$$

$$= \cos^2 x - \sin^2 x$$

$$= \cos(2x)$$

(B) $f(t) = \frac{1 - \sin t}{1 + \sin t}$

$$f'(t) = \frac{(1 + \sin t)(-\cos t) - (1 - \sin t)(\cos t)}{(1 + \sin t)^2}$$

$$= \frac{-\cos t - \sin t \cos t - \cos t + \sin t \cos t}{(1 + \sin t)^2}$$

$$= \frac{-2\cos t}{(1 + \sin t)^2}$$

(C) $y = x^3 \tan x$

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

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

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

(D) $g(\theta) = \csc^2 \theta = \csc \theta \cdot \csc \theta$

$$g'(\theta) = (-\csc \theta \cot \theta)(\csc \theta) + (\csc \theta)(-\csc \theta \cot \theta)$$

$$g'(\theta) = -2 \csc^2 \theta \cot \theta$$