Trig Derivatives

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$\frac{d}{dx}(\tan(x)) = \sec^2(x)$ $\frac{d}{dx}\sec(x) = \sec(x)\tan(x)$

$\frac{d}{dx}(\cot(x)) = -\csc^2(x)$ $\frac{d}{dx}[\csc(x)] = -\csc(x)\cot(x)$

**1. If $y = \tan(x) - \cot(x)$, then find y'.

$y' = \sec^2 x + \csc^2 x$

2. Evaluate $\lim_{h \to 0} \frac{4\sec(x+h) - 4\sec(x)}{h}$.

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

3. If a particle moving along the x-axis has a velocity given by $v(t) = \frac{-6\cot(t)}{5t}$, find the acceleration.

$a(t) = v'(t) = \frac{(5t)(6\csc^2 t) - (-6\cot t)(5)}{(5t)^2} = \frac{30t\csc^2 t + 30\cot t}{25t^2}$

4. Determine the point(s) at which the horizontal tangents occur on the graph of $y = 2\csc(x) + 3$ for $[0, 2\pi]$.

$y' = -2\csc x \cot x = 0$

$\cancel{\csc x = 0}$ $\cot x = 0$

$x = \pi/2$

$x = 0$
$y = 1$

$y = 2\csc\frac{\pi}{2} + 3$
$= 2 + 3 = 5$

$(\pi/2, 5)$