Trigonometric Derivatives

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$\frac{d}{dx}\left[\sin(x)\right] = \cos(x)$ $\quad$ $\frac{d}{dx}\left[\sec(x)\right] = \sec(x)\tan(x)$ $\quad$ $\frac{d}{dx}\left[\csc(x)\right] = -\csc(x)\cot(x)$

$\frac{d}{dx}\left[\cos(x)\right] = -\sin(x)$ $\quad$ $\frac{d}{dx}\left[\tan(x)\right] = \sec^2(x)$ $\quad$ $\frac{d}{dx}\left[\cot(x)\right] = -\csc^2(x)$

Higher Derivatives of $\sin(x)$

$f(x) = \sin(x)$ $\quad$ $f'(x) = \cos(x)$ $\quad$ $f''(x) = -\sin(x)$ $\quad$ $f'''(x) = -\cos(x)$

$f^{(4)}(x) = \sin(x)$ $\quad$ $f^{(5)}(x) = \cos(x)$ $\quad$ $f^{(6)}(x) = -\sin(x)$ $\quad$ $f^{(7)}(x) = -\cos(x)$

1. Use the product rule to compute derivative $f'(x)$ of the following.

A. $f(x) = 3x\,\sin x$

B. $f(x) = 5x^3\,\tan x$

C. $f(x) = 3x^2\,\cos x$

D. $f(x) = 2x^5\,\sec x$

E. $f(x) = 5\sin x\,\cos x$

F. $f(x) = 7\sin x\,\sec x$

G. $f(x) = x^4\,\sin x\,\tan x$

H. $f(x) = \sin x\,\tan x\,\sec x$

2. Find the tangent line to $y = x^2\,\sin x$ at $x = \frac{\pi}{2}$.

3. Use the quotient rule to compute derivative $f'(x)$ of the following.

A. $f(x) = \dfrac{3\sin x}{x+1}$

B. $f(x) = \dfrac{5x^3}{\tan x}$

C. $f(x) = \dfrac{5\cos x}{x^2+x}$

D. $f(x) = \dfrac{2\sec x}{x^5+x^3}$

E. $f(x) = \dfrac{5\sin x}{\cos x}$

F. $f(x) = \dfrac{7\sec x}{\cos x}$

G. $f(x) = \dfrac{x^4\,\tan x}{\sin x}$

H. $f(x) = \dfrac{\sin x\,\sec x}{\tan x}$

4. Find the tangent line to $y = \dfrac{\sin x}{x^2+1}$ at $x = 0$.