Compute the following derivatives.

$\frac{d}{dx} f(x)g(x) = f'(x)g(x) + f(x)g'(x)$

$\frac{d}{dx} \sqrt{x}\left(x^2+3x^4\right) = \frac{1}{2}x^{-1/2}\left(x^2+3x^4\right) + \sqrt{x}\left(2x+12x^3\right)$

$\frac{d}{dx} \sqrt[3]{x}\left(x^6+2x\right)$

$\frac{d}{dx} \sqrt[4]{x}\left(\sqrt{x}+5\right)$

$\frac{d}{dx} \left(x^3+\sqrt{x}\right)\left(x^{1/3}+x^{3/4}\right)$

$\frac{d}{dx} \left(x^{5/4}+6\right)\left(x^2+6x+2\right)$

$\frac{d}{dx} \left(x^2+3x^{-1}\right)\left(2x-10x^2\right)$

$\frac{d}{dx} \left(4x^7+7x^2\right)\left(\sqrt{x}+x^{-3}\right)$

$\frac{d}{dx} \left(\frac{1}{x}+x^3\right)\left(x^{-1}+\frac{1}{x^3}\right)$

$\frac{d}{dx} \left(\frac{1}{x^2}+x^3\right)\left(4x-90\right)$

Let $\frac{d}{dx}\sin(x) = \cos(x)$ and $\frac{d}{dx}\cos(x) = -\sin(x)$.

Compute:

$\frac{d}{dx}\left[\sin(x)\left(x^2+\sqrt{x}\right)\right] = \cos(x)\left(x^2+\sqrt{x}\right) + \sin(x)\left(2x+\frac{1}{2}x^{-1/2}\right)$

$\frac{d}{dx}\left[\sin(x)\cdot\sin(x)\right]$

$\frac{d}{dx}\left[\left(\sqrt{x}+5x^9\right)\cos x\right]$

$\frac{d}{dx}\left[\cos(x)\left(3x^2+2x-9\right)\right]$

$\frac{d}{dx}\left[\sin(x)\cos(x)\right]$

$\frac{d}{dx}\left[\left(\frac{1}{x}+\frac{1}{\sqrt[3]{x}}\right)\sin(x)\right]$

$\frac{d}{dx}\left[\left(\frac{3}{x^2}+\frac{4}{\sqrt[7]{x^3}}\right)\cos(x)\right]$

If $f'(2)=3$ and $g'(2)=4$, compute $(f\cdot g)'(2)$ given $f(2)=10$ and $g(2)=8$.