Calculate the following derivatives.

$\frac{d}{dx}\frac{\sin(x^2)\cos x}{x^3+3}$ (quotient 1st; product; chain) $=$ top$'$ $= \cos(x^2)(2x)\cos x + \sin(x^2)(-\sin x)$

$$= \frac{(\cos(x^2)(2x)\cos x + \sin(x^2)(-\sin x))(x^3+3) - (\sin(x^2)\cos x \cdot 3x^2)}{(x^3+3)^2}$$

$$= \frac{[2x\cos(x^2)\cos x - \sin(x^2)\sin x](x^3+3) - 3x^2 \sin x^2 \cos x}{(x^3+3)^2}$$

chain 1st

$$\frac{d}{dx}\tan\left(\frac{x^3+4}{\sin(x^3)}\right) = \sec^2\left(\frac{x^3+4}{\sin(x^3)}\right)\cdot\frac{(3x^2)\sin(x^3) - (x^3+4)\cos(x^3)3x^2}{\sin^2(x^3)}$$

$$= \sec^2\left(\frac{x^3+4}{\sin(x^3)}\right)\cdot 3x^2 \cdot \frac{\sin x^3 - (x^3+4)\cos x^3}{\sin^2 x^3}$$

$\frac{d}{dx}\sqrt[3]{\frac{\sin(4x)\tan x}{x^2+(3x+2)^2}}$ chain 1st

$$= \frac{1}{3}\left(\frac{\sin(4x)\tan x}{x^2+(3x+2)^2}\right)^{-2/3}\frac{(\cos(4x)\cdot 4\cdot\tan x + \sin(4x)\sec^2 x)(x^2+(3x+2)^2) - \sin(4x)\tan x\,(2x+2(3x+2)(3))}{(x^2+(3x+2)^2)^2}$$

$$= \frac{(4\cos(4x)\tan x + \sin 4x \sec^2 x)(10x^2+12x+4) - (20x+12)\sin 4x \tan x}{3\sqrt[3]{(\sin(4x)\tan x)^2(10x^2+12x+4)^4}}$$

$$\frac{d}{dx}\sec(\cot(5x^2+2)) = \sec(\cot(5x^2+2))\tan(\cot(5x^2+2))(-\csc^2(5x^2+2))(10x)$$

$$= -10x\sec(\cot(5x^2+2))\tan(\cot(5x^2+2))(\csc(5x^2+2))$$

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

$$= \frac{-\csc(4x+2)\cot(4x+2)(4)\left[\cos\sqrt{x^2+2}+3\right]-\csc(4x+2)\left[-\sin\left(\sqrt{x^2+2}\right)\frac{1}{2}(x^2+2)^{-1/2}(2x)\right]}{\left[\cos\left(\sqrt{x^2+2}\right)+3\right]^2}$$

$$= \frac{\csc(4x+2)\left[-4\cot(4x+2)\left(\cos\left(\sqrt{x^2+2}\right)+3\right)+\frac{x\left(\sin\left(\sqrt{x^2+2}\right)\right)}{\sqrt{x^2+2}}\right]}{\left[\cos\left(\sqrt{x^2+2}\right)+3\right]^2}$$

$$\frac{d}{dx}\ \csc\left(\frac{x^2+3x}{\sin(4x^3)}\right)\sqrt{\frac{1+8x}{\cot(3x^2)}}$$

$$= -\csc\left(\frac{x^2+3x}{\sin(4x^3)}\right)\cot\left(\frac{x^2+3x}{\sin(4x^3)}\right)\left(\frac{(2x+3)\sin(4x^3)-(x^2+3x)\cos(4x^3)\,12x^2}{\sin^2(4x^3)}\right)\sqrt{\frac{1+8x}{\cot(3x^2)}}\ +$$

$$\csc\left(\frac{x^2+3x}{\sin(4x^3)}\right)\frac{1}{2}\left(\frac{1+8x}{\cot(3x^2)}\right)^{-1/2}\left(\frac{8\cot 3x^2-(1+8x)(-\csc^2(3x^2)\cdot 6x)}{\cot^2(3x^2)}\right)$$

$$= -\csc\left(\frac{x^2+3x}{\sin(4x^3)}\right)\cot\left(\frac{x^2+3x}{\sin(4x^3)}\right)\left(\frac{(2x+3)\sin(4x^3)-(12x^4+36x^3)\cos(4x^3)}{\sin^2(4x^3)}\right)\sqrt{\frac{1+8x}{\cot(3x^2)}}\ +$$

$$\frac{\csc\left(\frac{x^2+3x}{\sin(4y^3)}\right)\left(\frac{4\cot 3x^2+(3x+24x^2)\csc^2(3x^2)}{\cot^2(3x^2)}\right)}{\sqrt{\frac{1+8x}{\cot(3x^2)}}}$$

$$\frac{d}{dx}\ \frac{(x^2+3x)\cot(x^3)}{x^4+\cos(x^7)}$$

$$= \frac{\left[(2x+3)\cot x^3+(x^2+3x)(-\csc^2(x^3)3x^2)\right]\left[x^4+\cos x^7\right]-(x^2+3x)\cot(y^3)(4x^3-\sin(x^7)\cdot 7x^6)}{\left[x^4+\cos x^7\right]^2}$$

$$= \frac{\left[(2x+3)\cot x^3-(3x^4+9x^3)\csc x^3\right]\left(x^4+\cos x^7\right)-(x^2+3x)\cot x^3\,(4x^3-7x^6\sin x^7)}{\left[x^4+\cos x^7\right]^2}$$

Note: could keep simplifying...