Calculus AB

2-3

(Day 2)

Product Rule, Quotient Rule, Trigonometric Derivatives, and Higher Order Derivatives

Trig Derivatives

$$\frac{d \sin x}{dx} = \cos x \qquad \frac{d \cos x}{dx} = -\sin x$$

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

$$\tan x = \frac{\sin x}{\cos x} \qquad \frac{d \tan x}{dx} = \frac{\cos x \cos x - (-\sin x)(\sin x)}{\cos^2 x \quad (\cos x)^2}$$

$$= \frac{\cos^2 x + \sin^2 x}{\cos^2 x} = \frac{1}{\cos^2 x} = \sec^2 x$$

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

$$= \frac{1}{\cos x}$$

$$f'(x) = \frac{0 \cos x - (-\sin x)(1)}{\cos^2 x}$$

$$= \frac{\sin x}{\cos x \cos x} = \tan x \sec x$$

$g(x) = \csc x, \; g'(x) = -\cot x \csc x$

$$= \frac{1}{\sin x}$$

$$g'(x) = \frac{0 \sin x - \cos x (1)}{\sin^2 x}$$

$$= \frac{-\cos x}{\sin x \cdot \sin x} = -\cot x \csc x$$

$h(x) = \cot x, \; h'(x) = -\csc^2 x$

$$= \frac{1}{\tan x}$$

$$h'(x) = \frac{0 \tan x - \sec^2 x (1)}{\tan^2 x} = \frac{-\sec^2 x}{\tan^2 x} = -\sec^2 x \cot^2 x$$

$$-\frac{1}{\cancel{\cos^2 x}} \cdot \frac{\cancel{\cos^2 x}}{\sin^2 x}$$

$$= -\frac{1}{\sin^2 x}$$

Complete the table without using the Quotient Rule. (pg 124)

	Function	Rewrite	Differentiate	Simplify
19)	$y = \dfrac{x^2 + 2x}{3}$	$\frac{1}{3}x^2 + \frac{2}{3}x$	$\frac{2}{3}x + \frac{2}{3}$	

Find an equation of the tangent line to the graph of f at the indicated point.

67) $f(x) = \tan x$ $\quad\left(\frac{\pi}{4}, 1 \right)$

$F'(x) = \sec^2 x$

$m = f'(\frac{\pi}{4}) = \sec^2(\frac{\pi}{4}) = (\sqrt{2})^2$

$= 2$

$y = 2x + b$

$1 = 2(\frac{\pi}{4}) + b$

$1 - \frac{\pi}{2} = b$

$y = 2x + (1 - \frac{\pi}{2})$

Assignment:

Pg. 124

19 - 53 odd,
58, 61, 66,
83, 84, 86,
93, 97, 99,
105-108 all