

## Math 130 Day 18

**Office Hours (LN 301/301.5):** M 3:30-4:30, Tu 11:00-1:00, W 12:15-1:15, F 1:30-2:30. Other times by appointment.  
**Math Intern:** Sun through Thurs: 3:00-6:00, 7:00-10:00pm. **Website:** Use the links at the course homepage on **Canvas** or go to my course Webpage: <http://math.hws.edu/~mitchell/Math130F16/index.html>.

### Practice, Practice, Practice Some More

Last time we discussed the product and quotient rules for derivatives. Today we will determine the derivatives of  $\sin x$  and  $\cos x$  and use these to determine the derivatives of  $\tan x$  and  $\sec x$ .

1. a) Re-read Chapter 3.4, especially the examples using the quotient rule and exponential functions.
- b) Now read in Chapter 3.5 on trig derivatives, pages 165-168. Finally, we will start the Chain Rule on Wednesday. Read Section 3.7.
2. a) Practice page 160: #13, 17, 19, 25(write as a quotient), 27, 29, 33, 35, 39, 41(simplify by dividing first), 47, 49(is this really a quotient rule problem?), 57, 67, and 75.
- b) Derivatives of trig functions page 169: #17-27 odd, 57, 59, and 61.

Day 18 Hand In-Quotient Rule/Trig Practice. Name: Answers

0. Do WeBWorK Set Day 18. Due Thursday night.

1. a)  $D_x \left( \frac{3x}{e^{4x} + 2x} \right) = \frac{3(e^{4x} + 2x) - 3x(4e^{4x} + 2)}{(e^{4x} + 2x)^2}$  (Simplify Answer)

$$= \frac{3e^{4x} + 6x - 12x^2e^{4x}}{(e^{4x} + 2x)^2}$$

$$= \frac{3e^{4x} [1 - 4x]}{(e^{4x} + 2x)^2}$$

b)  $D_x (2e^{6x} \sin x) = 12e^{6x} \sin x + 2e^{6x} \cos x$

$$= 2e^{6x} [6 \sin x + \cos x]$$

c) Hint: Write as a product.  $\frac{d}{dx} (\sin^2 x) = \frac{d}{dx} (\sin x \cdot \sin x)$  (Simplify Answer)

$$= \cos x \cdot \sin x + \sin x \cdot \cos x$$

$$= 2 \sin x \cos x$$

2. Basic Trig Derivatives in Combinations with other Rules: Determine

a)  $\frac{d}{dx}(9 \cos x - 8e^{2x}) = -9 \sin x - 16e^{2x}$

b)  $\frac{d}{dx}(4 \tan x \sec x) = 4 \sec^2 x \cdot \sec x + 4 \tan x \cdot \sec x \tan x$  (Simplify Answer)

Find  $\rightarrow = 4 \sec x [\sec^2 x + \tan^2 x]$   $\tan^2 x = \sec^2 x + 1$

or  $= 4 \sec x [\sec^2 x + \sec^2 x + 1]$   
 $= 4 \sec x (2 \sec^2 x + 1)$

c)  $\frac{d}{dx} \left( \frac{e^{-3x} + 1}{\sin x} \right) = \frac{-3e^{-3x}(\sin x) - (e^{-3x} + 1) \cos x}{\sin^2 x}$  (Do NOT Simplify Answer)

d)  $\frac{d}{dx} \left( \frac{\tan x}{1 + \sec x} \right) = \frac{\sec^2 x (1 + \sec x) - \tan x \sec x \tan x}{(1 + \sec x)^2}$  (Simplify Answer)

Find  $\rightarrow = \frac{\sec x [\sec x + \sec^2 x - \tan^2 x]}{(1 + \sec x)^2}$

$\sec^2 x - 1 = \tan^2 x$

or  $= \frac{\sec x [\sec x + \sec^2 x + 1 - \sec^2 x]}{(1 + \sec x)^2}$

$= \frac{\sec x [\sec x + 1]}{(1 + \sec x)^2} = \frac{\sec x}{1 + \sec x}$