Math 1a HW set #6 3.4 # 2, 3, 4, 13, 15, 23, 24, 28, 32, 35

#2 $f(x) = \sin x \cdot \cos x$

$f'(x) = \cos x \cdot \cos x + (\sin x)(-\sin x)$

$\boxed{f'(x) = \cos^2 x - \sin^2 x}$

#3 $f(x) = \frac{\sin x}{x}$ Use quotient rule (or product rule)

$\left(\frac{f}{g}\right)' = \frac{f'g - g'f}{g^2}$; $f = \sin x$, $g = x$

$\therefore \frac{d}{dx}\left(\frac{\sin x}{x}\right) = \boxed{\frac{x \cos x - \sin x}{x^2}}$

#4 $f(x) = x^2 \cos x$

$f'(x) = 2x \cdot \cos x + (-\sin x)x^2$

$f'(x) = \boxed{2x \cos x - x^2(\sin x)}$

#15 $f(x) = \sin^2 x + \cos^2 x = 1$

$\frac{d}{dx}(1) = \boxed{0}$

#13 on next page

Pg. ~~1~~ 2 Math 1a Hw set #6 # 2, 3, 4, 13, 15, 23, 24, 28, 32, 35

#13 $f(x) = \dfrac{\cot x}{1 + \csc x} = \dfrac{\frac{1}{\tan x}}{1 + \frac{1}{\sin x}} = \dfrac{\frac{\cos x}{\sin x}}{\frac{\sin x + 1}{\sin x}}$

$f(x) = \dfrac{\cos x}{\sin x + 1}$ Now use quotient rule to obtain

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

$$= \frac{\cancel{\sin x + 1}}{-(\sin x + 1)^{\cancel{2}}} = \frac{-1}{\sin x + 1} = \boxed{\frac{-\csc x}{1 + \csc x}}$$

sometimes it helps to rewrite cot, csc, sec, in terms of sin, cos, tan

#23 $y = \sin x \cos x$

$y' = \cos^2 x - \sin^2 x = \cos x \cdot \cos x - \sin x \cdot \sin x$

$y'' = -2 \sin x \cos x - 2 \sin x \cos x$

$$\boxed{= -4 \sin x \cos x}$$

Math 1a Hw set #6

3.4 #2, 3, 4, 13, 15, 23, 24, 28, 32, 35

#24 $y = \tan x \longrightarrow y' = \sec^2 x = \sec x \cdot \sec x$

$$\boxed{y'' = 2 \cdot \sec^2 x \cdot \tan x}$$

use product rule

#28 a.) $y = \cos x \quad y' = -\sin x \quad y'' = -\cos x$

$y = \sin x \quad y' = \cos x \quad y'' = -\sin x$

$y'' + y = 0$ for both

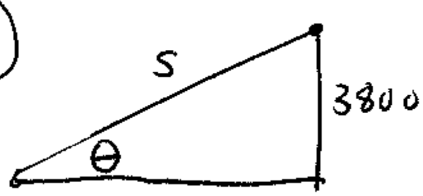
b.) $y = A \sin x + B \cos x$

$y' = A \cos x - B \sin x$

$y'' = -A \sin x - B \cos x$

$\Bigg\}$ $y'' + y = 0$ so it works

#32



$\sin \theta = \dfrac{3800}{s} \longrightarrow s = \dfrac{3800}{\sin \theta}$

So $s(\theta) = \dfrac{3800}{\sin \theta} \quad \dfrac{ds}{d\theta} = \dfrac{-3800}{\sin^2 \theta} \cdot \cos \theta$

$\dfrac{ds}{d\theta}(30^\circ) = \cancel{\boxed{-1097 \frac{\text{feet}}{\text{deg}}}} = \boxed{-13163 \frac{\text{feet}}{\text{rad}\ \cancel{\text{deg}}}} = \boxed{-229 \frac{\text{ft}}{\text{deg}}}$

#35 $\dfrac{d}{dx} = \dfrac{d^5}{dx^5} \cdots = \dfrac{d^{85}}{d^{85}} = \cos x \quad \therefore \quad \boxed{\dfrac{d^{87}}{dx^{87}} = -\cos x}$

b.) $\boxed{\cos x}$