

3.5

31)

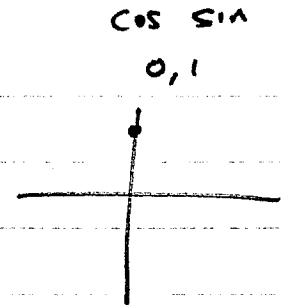
$$y = 4 + \cot x - 2 \csc x$$

$$y' = -\csc^2 x + 2 \csc x \cot x$$

$$= -\csc^2\left(\frac{\pi}{2}\right) + 2 \csc\left(\frac{\pi}{2}\right) \cot\left(\frac{\pi}{2}\right)$$

$$= -1 + 2(1)(0)$$

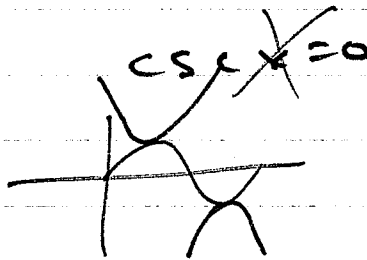
$$m = -1 \quad \left(\frac{\pi}{2}, 2\right)$$



$$-\csc^2 x + 2 \csc x \cot x = 0$$

$$y = \csc x (\cot x + 2 \cot x) = 0$$

$$-(1/\sin x)^2$$



~~$2 \cot x = 0$~~   
 ~~$2 \cot x = 1$~~   
 ~~$\cot x = \frac{1}{2}$~~   
 ~~$\tan x = 2$~~

$$-\frac{1}{\sin x} + 2 \frac{\cos x}{\sin x} = 0$$

$$-1 + 2 \cos x = 0$$

$$2 \cos x = 1$$

$$\cos x = \frac{1}{2}$$

$$x = \frac{\pi}{6}$$

$$\frac{-1 + 2 \cos x}{\sin x} = 0$$

40)

$$y = \sin x$$

$$y' = \cos x$$

$$y'(0) = \cos 0 = 1$$

$$y = x$$

25a)  $\tan x = \frac{\sin x}{\cos x}$

$$(\tan x)' = \frac{\cos^2 x + \sin^2 x}{\cos^2 x}$$

$$= \frac{1}{\cos^2 x}$$

$$= \sec^2 x$$

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$$25) (b) \sec x = \frac{f}{g}$$

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

$$= \frac{\sin x}{\cos^2 x}$$

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

$$= \tan x \cdot \sec x$$

$$37) g(x) = \begin{cases} x+b, & x < 0 \\ \cos x, & x \geq 0 \end{cases}$$

$$g'(x) = \begin{cases} 1, & x < 0 \\ -\sin x, & x \geq 0 \end{cases}$$

$$x+b = \cos x$$

$$0+b = \cos 0$$

$$b = 1$$

$$1 = -\sin 0$$

$$1 = -0$$

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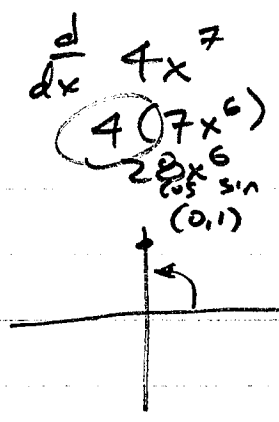
31)  $y = 4 + \cot x - 2\csc x$  (a) tangent at  $(\frac{\pi}{2}, 2)$

$$y' = -\csc^2 x + 2\csc x \cot x$$

$$y' = -\csc^2(\frac{\pi}{2}) + 2\csc(\frac{\pi}{2})\cot(\frac{\pi}{2})$$

$$-1 + 0 = -1$$

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



(b) horizontal tangent

$$-\csc^2 x + 2\csc x \cot x = 0 \quad 0 < x < 2$$

$$(1.047198, 2.2679492)$$

$$y = 2.2679492$$

7)  $y = \frac{4}{\cos x} = 4\sec x$   
 $\frac{dy}{dx} = 4\sec x \tan x$

25) (a)  $\frac{d}{dx} \tan x$

$$\frac{\frac{d}{dx} \sin x \cdot \cos x - (\sin x) \cdot \frac{d}{dx} \cos x}{(\cos x)^2}$$

$$\frac{\cos^2 x + \sin^2 x}{\cos^2 x}$$

$$\frac{1}{\cos^2 x}$$

$$\boxed{\sec^2 x}$$

(b)  $\frac{d}{dx} \sec x$

$$\frac{\frac{d}{dx} \frac{1}{\cos x} \cdot \cos x - (1) \cdot \frac{d}{dx} \cos x}{(\cos x)^2}$$

$$\frac{\sin x}{\cos^2 x}$$

$$\frac{1}{\cos x} \cdot \frac{\sin x}{\cos x}$$

$$\boxed{\sec x \cdot \tan x}$$

Pos 33)  $s = 2 - 2\sin t$   
 vel  $s' = -2\cos t$   $s'(\frac{\pi}{4}) = -2\cos(\frac{\pi}{4})$   
 acc  $s'' = 2\sin t$   $s''(\frac{\pi}{4}) = 2\sin(\frac{\pi}{4})$   
 jerk  $s''' = 2\cos t$   $s'''(\frac{\pi}{4}) = 2\cos(\frac{\pi}{4})$   
 SPEED =  $|-2\cos t|$  SPEED =  $|-2\cos(\frac{\pi}{4})|$

3.5 f g

$$\begin{aligned} 5) \quad y &= 4 - x^2 \sin x \\ \frac{dy}{dx} &= (-2x)(\sin x) + (\cos x)(-x^2) \\ &= -2x \sin x - x^2 \cos x \end{aligned}$$

$$\begin{aligned} 9) \quad y &= \frac{\cot x}{1 + \cot x} \\ \frac{dy}{dx} &= \frac{-\csc^2 x (1 + \cot x) - (-\csc^2 x) \cot x}{(1 + \cot x)^2} \end{aligned}$$

$$\frac{dy}{dx} = \frac{-\csc^2 x - \csc^2 x \cot x + \csc^2 x \cot x}{(1 + \cot x)^2}$$

$$\frac{dy}{dx} = \frac{-\csc^2 x}{(1 + \cot x)^2}$$

$$40) \quad y = \sin x$$

$$y' = \cos x$$

$$y'(0) = \cos(0) = 1$$

~~(0,0)~~

(0,0)

$$\boxed{y = x}$$

$$41) \quad \sin(0.12) \approx 0.12$$

$$\begin{aligned} 29) \quad y &= \sqrt{2} \cos x \\ y' &= -\sqrt{2} \sin x \end{aligned}$$