

3.5

$$(25) \frac{d}{dx} \tan x = \frac{\sin x}{\cos x} = \frac{f}{g}$$

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

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

$$\frac{d}{dx} \sec x = \frac{1}{\cos x}$$

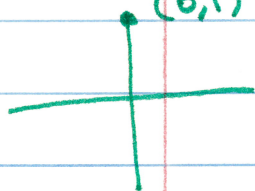
$$\frac{0 \cdot \cos x - (-\sin x) \cdot 1}{(\cos x)^2} = \frac{\sin x}{\cos^2 x} = \frac{1}{\cos x} \cdot \frac{\sin x}{\cos x} = \sec x \tan x$$

(a)

(31)  $(\frac{\pi}{2}, 2)$

cos sin

(0, 1)



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

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

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

$$= -1 + 2 \cdot 1 \cdot 0$$

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

$$0 \cdot 4 = 7 \cdot 0$$

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$$0 = 0$$

(31) b

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

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

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

$$\csc x = 0$$

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

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

$$\sin x \neq 0$$

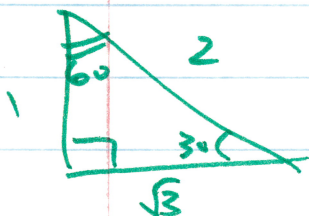
$$\sin x \left( \frac{-1 + 2 \cos x}{\sin x} \right) = (0) \sin x$$

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

$$2 \cos x = 1$$

$$\cos x = \frac{1}{2} \quad \begin{array}{l} \text{adj} \\ \text{hyp} \end{array}$$

$$x = \frac{\pi}{3}$$



$$60 \cdot \frac{\pi}{180}$$

$$y = 4 + \cot\left(\frac{\pi}{3}\right) - 2 \csc\left(\frac{\pi}{3}\right)$$

$$4 + \frac{1}{\sqrt{3}} - 2 \frac{2}{\sqrt{3}}$$

$$4 - \frac{\sqrt{3}}{\sqrt{3}}$$

$$\left(\frac{\pi}{3}, 4 - \sqrt{3}\right)$$

$$y - 4 + \sqrt{3} = 0 \left(x - \frac{\pi}{3}\right)$$

$$y = 4 - \sqrt{3}$$

3.5 f g

$$\textcircled{5} \quad y = 4 + (x^2) \sin x$$

$$\frac{(x^2 \sin x)^f}{\sin x}$$

$$\left(\frac{x^2}{\sin x}\right)^f + \tan x$$

f g

$$\textcircled{23} \quad y = x^2 \sin x \quad x = 3$$

$$y(3) = 3^2 \sin 3$$

$$y(3) = 9 \sin 3$$

$$(3, 9 \sin 3)$$

~~$$y = 9 \sin 3 = 6 \sin 3 + ?$$~~

$$y' = 2x \sin x + x^2 \cos x$$

$$y'(3) = 2(3) \sin 3 + 3^2 \cos 3$$

$$m = 6 \sin 3 + 9 \cos 3$$

$$y - 9 \sin 3 = (6 \sin 3 + 9 \cos 3)(x - 3)$$

$$\frac{z + 8}{z}$$

$$1 + 8 = 9$$

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

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

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

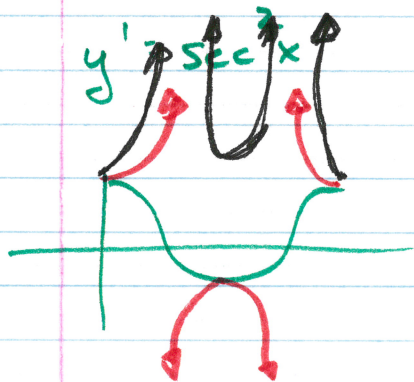
$$= \boxed{\sec^2 x}$$

(b)  $\frac{d}{dx} \sec x = \frac{d}{dx} \frac{1}{\cos x}$

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

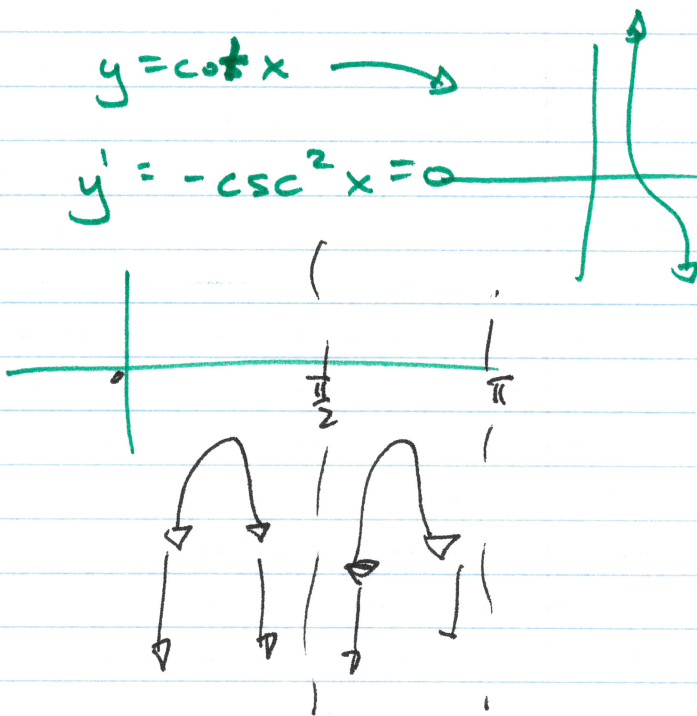
$$\frac{\sin x}{\cos^2 x} = \frac{1}{\cos x} \cdot \frac{\sin x}{\cos x} = \boxed{\sec x \tan x}$$

(28)  $y = \tan x$

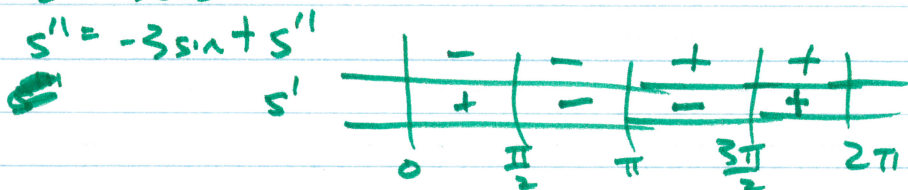


$y = \cot x$

$y' = -\csc^2 x = 0$



(13) (c)  $s = 2 + 3 \sin t$   
 $s' = 3 \cos t$   
 $s'' = -3 \sin t$





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(27)

$$y = \sec x$$

$$y = \cos x$$

$$y' = \sec x \tan x$$

$$y' = -\sin x$$

$$y'(0) = \sec 0 \tan 0 = 0$$

$$y'(0) = -\sin 0 = 0$$

(31)

$$y = 4 + \cot x - 2 \csc x \quad \left(\frac{\pi}{2}, 2\right)$$

(a)

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

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

$$-1 + 0 = -1 = m$$

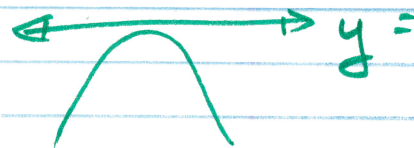
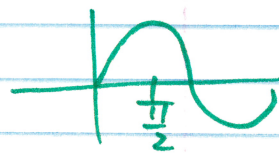
$$y - 2 = -1 \left(x - \frac{\pi}{2}\right)$$

(b)

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

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

$$x = 1.0471976$$



$$y = 4 + \cot(1.0471976) - 2 \csc(1.0471976) = 2.268$$

$$\boxed{y = 2.268}$$

(37)

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

$$(a) \begin{aligned} 0+b &= \cos 0 \\ b &= 1 \end{aligned}$$

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

$$(b) \begin{aligned} 1 &= -\sin(0) \\ 1 &= 0 \end{aligned}$$

NO  $b$  MAKES  
 $g(x)$  DIFF.  
AT  $x=0$

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$$\textcircled{41} \text{ (a) } y = x$$

$$y = .12$$

$$\text{(b) } \sin .12 \approx .1197$$

$$y' = \cos x \quad y = \sin x, x=0$$

$$y'(0) = \cos 0 \quad y = \sin 0$$

$$= 1 \quad = 0 \quad (0,0)$$

$$\boxed{y = x}$$

$$\textcircled{32} \quad y = 1 + \sqrt{2} \csc x + \cot x$$

$$\text{(a) } \left(\frac{\pi}{4}, 4\right)$$

$$y = -4\left(x - \frac{\pi}{4}\right) + 4$$

$$\text{(b) } y' = -\sqrt{2} \csc x \cot x - \csc^2 x = 0$$

$$\csc x (-\sqrt{2} \cot x - \csc x) = 0$$

$$\csc x \neq 0 \quad -\sqrt{2} \cot x = \csc x$$

$$-\sqrt{2} \cos x = 1$$

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

$$x = 2.356$$

$$y = 1 + \sqrt{2} \csc(2.356) + \cot(2.356)$$

$$= 2 \quad (2.356, 2)$$

$$\boxed{y = 2}$$