

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

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

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

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

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

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

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

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

$$2 \cot x = \csc x$$

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

$$2 \cos x = 1$$

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

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

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

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

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

$$4 - \sqrt{3}$$

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

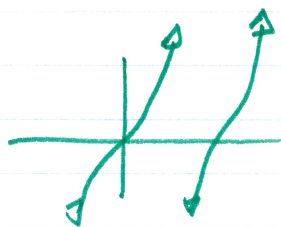
15)  $s = 2 \sin t + 3 \cos t$

$$v = 2 \cos t - 3 \sin t$$

$$a = -2 \sin t - 3 \cos t$$

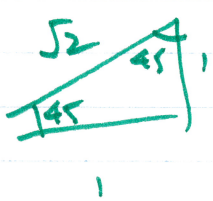
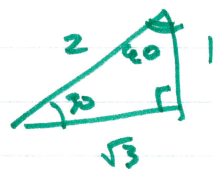
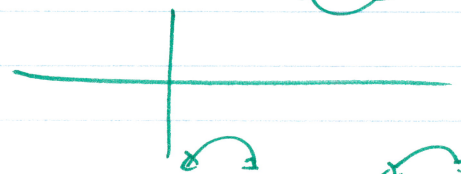
$$\text{speed} = |2 \cos t - 3 \sin t|$$

20)  $y = \tan x$   
 $y' = \sec^2 x$



$$y = \cot x$$
  

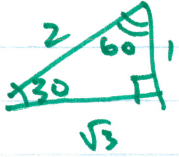
$$y' = -\csc^2 x$$



3.5

30

$$y = 2x$$
$$m = 2$$

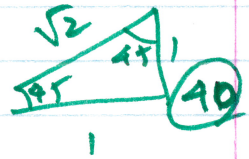


$$y = \tan x$$
$$\frac{dy}{dx} = \sec^2 x = 2$$
$$x = \frac{\pi}{4}$$

$$\tan \frac{\pi}{4} = 1$$

$$\left(\frac{\pi}{4}, 1\right)$$

$$y - 1 = 2 \left(x - \frac{\pi}{4}\right)$$



$$y = \sin x$$

(0,0)

$$\frac{dy}{dx} = \cos x$$

$$\frac{dy}{dx} = \cos 0 = 1$$

$$y = x$$

41

$$\sin(0.12) \approx 0.12$$

3.5

$$(3) y = \frac{1}{x} + 5\sin x$$

$$y = x^{-1} + 5\sin x$$

$$y' = -x^{-2} + 5\cos x$$

$$= -\frac{1}{x^2} + 5\cos x$$



$$(22) y = \sec x @ x = \frac{\pi}{4} \quad \left( \frac{\pi}{4}, \sqrt{2} \right)$$

$$y = \sec \frac{\pi}{4} = \sqrt{2}$$

$$\frac{\sqrt{2}^2}{\sqrt{2}} = \sqrt{2}$$

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

$$y' \left( \frac{\pi}{4} \right) = \sec \frac{\pi}{4} \tan \frac{\pi}{4}$$

$$= \sqrt{2} \cdot 1 = \sqrt{2} = m$$

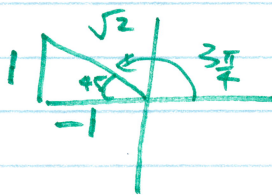
TANGENT:  $y - \sqrt{2} = \sqrt{2} \left( x - \frac{\pi}{4} \right)$

NORMAL:  $y - \sqrt{2} = -\frac{1}{\sqrt{2}} \left( x - \frac{\pi}{4} \right)$

$$(25) (a) \frac{d}{dx} \tan x = \frac{\sin x}{\cos^2 x}$$

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

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



$$(44) s(t) = -3\sin t$$

$$s'(t) = -3\cos t$$

$$s' \left( \frac{3\pi}{4} \right) = -3\cos \left( \frac{3\pi}{4} \right)$$

$$= -3 \left( -\frac{1}{\sqrt{2}} \right)$$

$$= \frac{3}{\sqrt{2}}$$