

13. $x^2 \csc 5x$

$$x^2 \cdot -\csc 5x \cot 5x \cdot 5 + \csc 5x (2x)$$

$$-5x^2 \csc 5x \cot 5x + 2x \csc 5x$$

$$\boxed{x \csc 5x (-5x \cot 5x + 2)}$$

15. $\tan^2 x \sec^3 x$

$$\tan^2 x \cdot 3 \sec^2 x \cdot \sec x \tan x + \sec^3 x \cdot 2 \tan x \cdot \sec^2 x$$

$$3 \sec^3 x \tan^3 x + 2 \sec^5 x \tan x$$

$$\boxed{\sec^3 x \tan x (3 \tan^2 x + 2 \sec^2 x)}$$

17. $(\sin 5x - \cos 5x)^5$

$$5(\sin 5x - \cos 5x)^4 (\cos 5x (5) + \sin 5x (5))$$

$$\boxed{25(\sin 5x - \cos 5x)^4 (\cos 5x + \sin 5x)}$$

19. $\cot^3(3x+1)$

$$3 \cot^2(3x+1) (-\csc^2(3x+1)) (3)$$

$$\boxed{-9 \cot^2(3x+1) \csc^2(3x+1)}$$

21. $\frac{\cos 4x}{1 - \sin 4x}$

$$1 - \sin 4x$$

$$\frac{(1 - \sin 4x)(-\sin 4x)^4 - (\cos 4x)(-\cos 4x)(4)}{(1 - \sin 4x)^2}$$

$$-4 \sin^4 4x (1 - \sin 4x) + 4 \cos^2 4x$$

$$(1 - \sin 4x)^2$$

$$-4 \sin^4 4x + (4 \sin^2 4x + 4 \cos^2 4x)$$

$$(1 - \sin 4x)^2$$

$$\frac{4(\sin^2 4x + \cos^2 4x)}{4(1)}$$

$$\frac{-4\sin 4x + 4}{(1 - \sin 4x)^2}$$

$$\frac{4(-\sin 4x + 1)}{(1 - \sin 4x)^2}$$

$$\boxed{\frac{4}{1 - \sin 4x}}$$

23. $\frac{\tan(2x - x^3)}{\sec^2(2x - x^3)} (2 - 3x^2)$

$$\boxed{\frac{(2 - 3x^2) \cdot \sec^2(2x - x^3)}{\sec^2(2x - x^3)}}$$

25. $\left(\frac{\sin x}{1 + \cos x}\right)^2$

$$2 \left(\frac{\sin x}{1 + \cos x}\right) \left[\frac{(1 + \cos x)(\cos x) - \sin x(-\sin x)}{(1 + \cos x)^2} \right]$$

$$\frac{2\sin x (\cos x + \cos^2 x + \sin^2 x)}{(1 + \cos x)^3}$$

$$\frac{2\sin x (\cos x + 1)}{(1 + \cos x)^3}$$

$$\boxed{\frac{2\sin x}{(1 + \cos x)^2}}$$

27. $\frac{\cos(\sin x)}{-\sin(\sin x)} (\cos x)$

$$\boxed{\frac{-\cos x \sin(\sin x)}{-\cos x \sin(\sin x)}}$$

$$21. \tan^3(2x) - \sec^3(2x)$$

$$3 \tan^2(2x) \cdot \sec^2(2x) \cdot 2 - (3 \sec^2(2x) \sec(2x) \tan(2x) \cdot 2)$$

$$6 \tan^2(2x) \sec^2(2x) - 6 \sec^3(2x) \tan(2x)$$

$$6 \tan(2x) \sec^2(2x) (\tan(2x) - \sec(2x))$$

$$31. \frac{\csc 3x}{x^3+1}$$

$$x^3+1$$

$$\frac{(x^3+1)(-\csc 3x \cot 3x \cdot 3) - \csc 3x (3x^2)}{(x^3+1)^2}$$

$$= \frac{-3(x^3+1)(\csc 3x \cot 3x) - 3x^2(\csc 3x)}{(x^3+1)^2}$$

$$= \frac{-3 \csc 3x ((x^3+1) \cot 3x - x^2 \csc 3x)}{(x^3+1)^2}$$

$$33. \sec(\tan x)$$

$$\frac{\sec(\tan x) \tan(\tan x) \cdot \sec^2 x}{\sec^2 x \sec(\tan x) \tan(\tan x)}$$

$$35. y = \sec^2 3x$$

$$\frac{dy}{dx} = 2 \sec 3x \sec 3x \tan 3x \cdot 3$$

$$= 6 \sec^2 3x \tan 3x$$

$$\frac{d^2 y}{dx^2} = 6 \left[\sec^2 3x \cdot \sec^2 3x \cdot 3 + \tan 3x \cdot 6 \sec 3x \sec 3x \tan 3x \right]$$

$$6 \left[3 \sec^4 3x + 6 \sec^2 3x \tan^2 3x \right]$$

$$18 \sec^2 3x \left[\sec^2 3x + 2 \tan^2 3x \right]$$

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

$$18 \sec^2 3x \left[1 + \tan^2 3x + 2 \tan^2 3x \right]$$

$$18 \sec^2 3x \left[1 + 3 \tan^2 3x \right]$$

$$37. y = \sin x - x \cos x$$

$$y' = \cos x - (x(-\sin x) + \cos x)$$

$$= \cos x + x \sin x - \cos x$$

$$y' = x \sin x$$

$$y'' = x(\cos x) + \sin x$$

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

$$39. y = (\tan x)^{1/2}$$

$$\frac{x^4 - x^6}{x^4(1-x^2)}$$

$$y' = \frac{1}{2} (\tan x)^{-1/2} \sec^2 x$$

$$y' = \frac{\sec^2 x}{2 (\tan x)^{1/2}}$$

$$y'' = \frac{2(\tan x)^{1/2} \cdot 2\sec x \cdot \sec \tan x - \sec^2 x (\tan x)^{-1/2} \cdot \sec^2 x}{4 \tan^{3/2} x - \sec^4 x (\tan x)^{-1/2}}$$

$$\frac{\sec^2 x \tan^{1/2} x (4 \tan^2 x - \sec^2 x)}{4 \tan^{3/2} x - (1 + \tan^2 x)}$$

$$\frac{\sec^2 x (4 \tan^2 x - (1 + \tan^2 x))}{4 \tan^{3/2} x}$$

$$\frac{\sec^2 x (3 \tan^2 x - 1)}{4 \tan^{3/2} x}$$

$$\frac{\sec^2 x (3(\sec^2 x - 1) - 1)}{4 \tan^{3/2} x}$$

$$\frac{\sec^2 x (3\sec^2 x - 3 - 1)}{4 \tan^{3/2} x}$$

$$\frac{\sec^2 x (3\sec^2 x - 4)}{4 \tan^{3/2} x}$$

$$49. y = 8 \sin^3 x \quad P\left(\frac{\pi}{6}, 1\right)$$

$$y' = 24 \sin^2 x (\cos x)$$

$$m = 24 \sin^2\left(\frac{\pi}{6}\right) \cos\frac{\pi}{6}$$

$$24 \cdot \frac{1}{4} \cdot \frac{\sqrt{3}}{2}$$

$$\frac{24 \sqrt{3}}{8}$$

$$m = \underline{3\sqrt{3}}$$

$$\underline{\text{tan}} \quad y - 1 = 3\sqrt{3} (x - \frac{\pi}{6})$$

$$\underline{\text{norm}} \quad y - 1 = \frac{-1}{3\sqrt{3}} (x - \frac{\pi}{6})$$