

$$1. y = 4 \csc^3(5x^2 + 2x)$$

$$\frac{dy}{dx} = 12 \csc^2(5x^2 + 2x) [-\csc(5x^2 + 2x) \cot(5x^2 + 2x)] (10x + 2)$$

$$= -24(5x + 1) \csc^3(5x^2 + 2x) \cot(5x^2 + 2x)$$

$$2. y = 2 \tan^3(2x) \sec^4(2x)$$

$$\frac{dy}{dx} = 6 \tan^2(2x) \sec^2(2x) (2) \sec^4(2x) + 8 \sec^3(2x) \sec(2x) \tan(2x) (2) \tan^3(2x)$$

$$= 12 \tan^2(2x) \sec^6(2x) + 16 \tan^4(2x) \sec^4(2x)$$

$$= 4 \tan^2(2x) \sec^4(2x) [3 \sec^2(2x) + 4 \tan^2(2x)]$$

$$3. \quad \frac{d}{dx} \left(\frac{[\cot^2(4x) + 5]^3}{(4 - \tan^3 4x)^2} \right) = \frac{d}{dx} \left(\frac{u}{v} \right) = \frac{u'v - uv'}{v^2}$$

$$u'v - uv' =$$

$$3 [\cot^2 4x + 5]^2 [(2 \cot 4x)(-\csc 4x)(4)] [4 - \tan^3(4x)]^2$$

$$- 2 [4 - \tan^3 4x] [(-3 \tan^2 4x \sec^2 4x)(4)] [\cot^2(4x + 5)]^2$$

$$= -24 [\cot^2 4x + 5]^2 [\cot 4x \csc 4x] [4 - \tan^3 4x]^2$$

$$+ 24 [\cot^2 4x + 5]^2 [\tan^2 4x \sec 4x] [4 - \tan^3 4x]$$

$$= 24 [\cot^2 4x + 5]^2 [4 - \tan^3(4x)] \left[-(\cot 4x \csc 4x)(4 - \tan^3 4x) + \tan^2 4x \sec 4x \right]$$

$$\frac{u'v - uv'}{v^2} = \frac{24 [\cot^2 4x + 5]^2 [4 - \tan^3 4x] [-(\cot 4x \csc 4x)(4 - \tan^3 4x) + \tan^2 4x \sec 4x]}{[4 - \tan^3 4x]^4}$$

$$= \frac{24 [\cot^2 4x + 5]^2 [-(\cot 4x \csc 4x)(4 - \tan^3 4x) + \tan^2 4x \sec 4x]}{[4 - \tan^3 4x]^3}$$

$$4. f(x) = (x - \sec^3 2x)^{-3} \quad x = \frac{\pi}{2}$$

$$f'(x) = 3(x - \sec^3 2x)^2 (1 - 6\sec^2 2x \sec 2x \tan 2x)$$

$$f'(\frac{\pi}{2}) = m = 3(\frac{\pi}{2} - \sec^3 \pi)^2 (1 - 6\sec^3 \pi \tan \pi)$$

$$= 3\left[\frac{\pi}{2} + 1\right]^2 [1 - 6(-1)(0)] \approx 3(6.609) \approx 19.8.$$

$$f(\frac{\pi}{2}) = \left(\frac{\pi}{2} - \sec^3 \pi\right)^3 = \left(\frac{\pi}{2} + 1\right)^3 \approx 17 \quad P\left(\frac{\pi}{2}, 17\right)$$

$$y - 17 = 19.8\left(x - \frac{\pi}{2}\right)$$

$$y = 19.8x - 14.1$$