

$$1. \frac{d}{dx} \left( \frac{3}{\sin^4(5x)} \right) = \frac{-60 \cos(5x)}{\sin^5(5x)}$$

$$2. \frac{d}{d\theta} (\sec(\theta^2) \tan(\theta^2)) = 2\theta [\sec^3(\theta^2) + \sec(\theta^2) \tan^2(\theta^2)] = 2\theta \sec(\theta^2)(\sec^2 \theta^2 + \tan^2 \theta^2)$$

$$3. \frac{d}{d\theta} \left( \sqrt{\tan^4(\theta) + 1} \right) = \frac{4 \tan^3 \theta \sec^2 \theta}{2\sqrt{\tan^4 \theta + 1}}$$

$$4. \frac{d}{dx} \left( \frac{x \cot(3x)}{x^2 + 1} \right) = \frac{(x^2 + 1)[-3x \csc^2(3x) + \cot(3x)] - 2x^2 \cot(3x)}{(x^2 + 1)^2}$$

$$5. \frac{d}{dx} \int_3^{x^2} \cot^4(t) dt = \cot^4(x^2) \frac{d}{dx} x^2 = 2x \cot^4(x^2)$$

$$6. \int \frac{\cos\left(\frac{3}{x}\right)}{x^2} dx = \frac{-\sin\left(\frac{3}{x}\right)}{3} + C$$

$$7. \int (1 - \tan^2 x) dx = \int (2 - \sec^2 x) dx = 2x - \tan x + C$$

$$8. \int \frac{x+1}{x^2+2x-3} dx = \frac{1}{2} \ln|x^2+2x-3| + C$$

$$9. \int \left( \frac{1}{2x} + 3x \right)^2 dx = \int \left( \frac{1}{4x^2} + 3 + 9x^2 \right) dx = \frac{-1}{4x} + 3x + 3x^3 + C$$

$$10. \int_0^{\frac{\sqrt{\pi}}{2}} 3\theta \sec(\theta^2) \tan(\theta^2) d\theta = \frac{3}{2} \sec(\theta^2) \Big|_0^{\frac{\sqrt{\pi}}{2}} = \frac{3\sqrt{2}-3}{2}$$