

$$1. y = 5 \operatorname{arccsc}^3(3x^2)$$

$$\frac{dy}{dx} = 5(3 \operatorname{arccsc}^2(3x^2)) \left( -\frac{1}{3x^2 \sqrt{9x^4 - 1}} \right) (6x)$$

$$= - \frac{30 \operatorname{arccsc}^2(3x^2)}{x \sqrt{9x^4 - 1}}$$

$$2. y = \frac{4}{\arcsin^2 4x}$$

$$\frac{dy}{dx} = \frac{(-2 \arcsin 4x) \left( \frac{4}{\sqrt{1-16x^2}} \right)}{\arcsin^4 4x} = \frac{-8}{\sqrt{1-16x^2} \arcsin^3 4x}$$

$$3. y = \arctan^2 2x \operatorname{arccot} 2x$$

$$\frac{dy}{dx} = 2 \arctan 2x \left( \frac{1}{1+4x^2} \right) \operatorname{arccot} 2x + \left( \frac{-2}{1+4x^2} \right) \arctan^2 2x$$

$$= 2 \arctan 2x \left[ \frac{2 \operatorname{arccot} 2x}{1+4x^2} - \frac{\arctan^2 2x}{1+4x^2} \right]$$

$$= 2 \arctan 2x \left[ \frac{2 \operatorname{arccot} 2x - \arctan^2 2x}{1+4x^2} \right]$$

$$4. \quad y = \frac{\operatorname{arcsec} 3x}{\sqrt{1-9x^2}}$$

$$\frac{dy}{dx} = \frac{\left( \frac{1}{3x\sqrt{1-9x^2}} \right) (\sqrt{1-9x^2}) - (-9x)(1-9x^2)^{-\frac{1}{2}} \operatorname{arcsec} 3x}{(1-9x^2)}$$

$$= \left( \frac{1}{3x} + \frac{9x \operatorname{arcsec} 3x}{\sqrt{1-9x^2}} \right) \frac{1}{1-9x^2}$$

$$= \frac{\sqrt{1-9x^2} + 27x^2 \operatorname{arcsec} 3x}{3x \sqrt{1-9x^2}} \cdot \frac{1}{1-9x^2}$$

$$= \frac{\sqrt{1-9x^2} + 27x^2 \operatorname{arcsec} 3x}{3x(1-9x^2)\sqrt{1-9x^2}}$$