

HW DAY 48 Solution

$$1. \frac{d}{dx} [\cos^{-1}(x^2)] = \frac{-2x}{\sqrt{1-x^4}}$$

$$2. \frac{d}{dx} [\sin^{-1}(\sqrt{2x})] = \frac{\frac{2}{2\sqrt{2x}}}{\sqrt{1-2x}} = \frac{1}{\sqrt{2x}\sqrt{1-2x}} = \frac{1}{\sqrt{2x-4x^2}}$$

$$3. y = \sin^{-1}\left(\frac{3}{t^2}\right)$$

$$\frac{d}{dt} [\sin^{-1}(3t^{-2})] = \frac{-6t^{-3}}{\sqrt{1-9t^{-4}}} = \frac{-6}{t^3 \sqrt{1-\frac{9}{t^4}}} = \frac{-6}{t^3 \sqrt{\frac{t^4-9}{t^4}}}$$

$$= \frac{-6}{t^3 \frac{\sqrt{t^4-9}}{t^2}} = \frac{-6}{t^2 \sqrt{t^4-9}} = \frac{-6}{t \sqrt{t^4-9}}$$

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

$$= \frac{x}{\sqrt{1-x^2}} + \sin^{-1} x - \frac{x}{\sqrt{1-x^2}}$$

$$= \sin^{-1} x$$

$$5. \frac{d}{ds} [\sec^{-1} 5s] = \frac{5}{|5s| \sqrt{25s^2-1}} = \frac{1}{|s| \sqrt{25s^2-1}}$$

$$6. \frac{d}{dt} [\cot^{-1} \sqrt{t-1}] = \frac{-\frac{1}{2\sqrt{t-1}}}{t-1+1} = \frac{-\frac{1}{2\sqrt{t-1}}}{t} = \frac{-1}{2t\sqrt{t-1}}$$

$$7. \frac{d}{dx} [\sin^{-1}\left(\frac{x}{2}\right)] = \frac{\frac{1}{2}}{\sqrt{1-\frac{x^2}{4}}} = \frac{1}{2\sqrt{4-x^2}} = \frac{1}{2\sqrt{4-x^2}} = \frac{1}{\sqrt{4-x^2}} = \frac{1}{\sqrt{4-x^2}}$$

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$$8. \frac{d}{dx} [3 - 7x^3 + 3x^7] = -21x^2 + 21x^6$$

$$9. \frac{d}{dx} \left[\frac{2x+1}{2x-1} \right] = \frac{(2x-1)(2) - (2x+1)(2)}{(2x-1)^2} = \frac{4x-2-4x-2}{(2x-1)^2}$$

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

$$10. \frac{d}{dt} \left[\cot \frac{2}{t} \right] = \frac{d}{dt} \left[\cot (2t^{-1}) \right] = -\csc^2 (2t^{-1}) (-2t^{-2})$$

$$= \frac{2\csc^2 (2t^{-1})}{t^2} = \frac{2\csc^2 \left(\frac{2}{t} \right)}{t^2}$$

$$11. \frac{d}{dx} \left[x\sqrt{2x+1} \right] = x \left(\frac{2}{2\sqrt{2x+1}} \right) + (\sqrt{2x+1})(1)$$

$$= \frac{x}{\sqrt{2x+1}} + \frac{\sqrt{2x+1}}{1} = \frac{x + 2x+1}{\sqrt{2x+1}}$$

$$= \frac{3x+1}{\sqrt{2x+1}}$$

$$12. \frac{d}{d\theta} \left[\tan^2 (3-\theta^2) \right] = 2\tan (3-\theta^2) (\sec^2 (3-\theta^2)) (-2\theta)$$

$$= -4\theta \tan (3-\theta^2) \sec^2 (3-\theta^2)$$

$$13. \frac{d}{dx} [\ln \sqrt{x}] = \frac{d}{dx} \left[\ln x^{\frac{1}{2}} \right] = \frac{d}{dx} \left[\frac{1}{2} \ln x \right] = \frac{1}{2} \cdot \frac{1}{x} = \frac{1}{2x}$$

$$14. \frac{d}{dx} [xe^{-x}] = x e^{-x} (-1) + e^{-x} (1) = e^{-x} (-x+1)$$

$$15. \frac{d}{dx} [\ln \sin x] = \frac{\cos x}{\sin x} = \cot x$$