



Differentiate 1-7:

$$1. \sqrt[3]{2x+7}. \quad \frac{d}{dx} (2x+7)^{1/3} = \frac{1}{3} (2x+7)^{-2/3} \cdot 2 = \frac{2}{3} (2x+7)^{-2/3}.$$

$$2. \sin^3(x^2). \quad 3 \sin^2(x^2) \cdot (\cos x^2) 2x = 6x \sin^2(x^2) \cos x^2.$$

$$3. \frac{2+e^x}{3+e^x}. \quad \frac{(3+e^x)e^x - (2+e^x)e^x}{(3+e^x)^2} = \frac{3e^x + e^{2x} - 2e^x - e^{2x}}{(3+e^x)^2} = \frac{e^x}{(3+e^x)^2}.$$

$$4. \tan^{-1}(2 \cos(x)). \quad \frac{1}{4 \cos^2 x + 1} \cdot 2 \cdot (-\sin x) = \frac{-2 \sin x}{4 \cos^2 x + 1}.$$

$$5. \sqrt{x^2+x^{-2}} \cdot e^{x^2}. \quad \frac{2x + (-2)x^{-3}}{2 \sqrt{x^2+x^{-2}}} \cdot e^{x^2} + \sqrt{x^2+x^{-2}} \cdot e^{x^2} \cdot 2x = \left(\frac{x+x^{-3}}{\sqrt{x^2+x^{-2}}} + 2x \sqrt{x^2+x^{-2}} \right) e^{x^2}$$

$$6. \ln \frac{x+3}{x+2}. \quad \frac{d}{dx} \left(\ln \frac{x+3}{x+2} \right) = \frac{d}{dx} (\ln(x+3) - \ln(x+2)) = \frac{1}{x+3} - \frac{1}{x+2} = \frac{-1}{(x+3)(x+2)}$$

$$7. x^{\ln x}. \quad \frac{d}{dx} (x^{\ln x}) = \frac{d}{dx} (e^{(\ln x)(\ln x)}) = \frac{d}{dx} (e^{(\ln x)^2}) = e^{(\ln x)^2} (2 \ln x) \frac{1}{x} = \frac{2 x^{\ln x} \cdot \ln x}{x}$$

8. Implicitly differentiate both sides with respect to x :

$$\frac{x}{y} = \sin y.$$

$$\frac{y \cdot 1 - x \frac{dy}{dx}}{y^2} = \cos y \frac{dy}{dx}$$

$$\frac{1}{y} - \frac{x}{y^2} \frac{dy}{dx} = \cos y \frac{dy}{dx}$$