

name: solution

1 (4 points each). Calculate the derivatives of the following functions:

(a) $y = \sqrt[3]{x^2 + 9}$

(b) $y = \sin(4 \cos(z))$

(c) $y = x(x+1)^{1/3}$

$$\begin{aligned} (a) \quad \frac{dy}{dx} &= \frac{d}{dx} \left((x^2 + 9)^{1/3} \right) = \frac{1}{3} (x^2 + 9)^{-2/3} \frac{d}{dx} (x^2 + 9) \\ &= \frac{1}{3} (x^2 + 9)^{-2/3} (2x) \end{aligned}$$

$$\begin{aligned} (b) \quad \frac{dy}{dz} &= \frac{d}{dz} (\sin(4 \cos(z))) = \cos(4 \cos(z)) \frac{d}{dz} (4 \cos(z)) \\ &= \cos(4 \cos(z)) (-4 \sin(z)) = -4 \sin(z) \cdot \cos(4 \cos(z)) \end{aligned}$$

$$\begin{aligned} (c) \quad \frac{dy}{dx} &= \frac{d}{dx} (x(x+1)^{1/3}) = \frac{d}{dx} (x) \cdot (x+1)^{1/3} + x \cdot \frac{d}{dx} (x+1)^{1/3} \\ &= (x+1)^{1/3} + x \left(\frac{1}{3} (x+1)^{-2/3} \frac{d}{dx} (x+1) \right) \\ &= (x+1)^{1/3} + \frac{1}{3} x (x+1)^{-2/3} \end{aligned}$$