

Exercise 13

Differentiate the function.

$$G(y) = \ln \frac{(2y + 1)^5}{\sqrt{y^2 + 1}}$$

Solution

Take the derivative of the function.

$$\begin{aligned} G'(y) &= \frac{d}{dy} \left[\ln \frac{(2y + 1)^5}{\sqrt{y^2 + 1}} \right] \\ &= \frac{d}{dy} \left[\ln(2y + 1)^5 - \ln \sqrt{y^2 + 1} \right] \\ &= \frac{d}{dy} \left[5 \ln(2y + 1) - \frac{1}{2} \ln(y^2 + 1) \right] \\ &= 5 \frac{d}{dy} [\ln(2y + 1)] - \frac{1}{2} \frac{d}{dy} [\ln(y^2 + 1)] \\ &= 5 \cdot \frac{1}{2y + 1} \cdot \frac{d}{dy} (2y + 1) - \frac{1}{2} \cdot \frac{1}{y^2 + 1} \cdot \frac{d}{dy} (y^2 + 1) \\ &= 5 \cdot \frac{1}{2y + 1} \cdot (2) - \frac{1}{2} \cdot \frac{1}{y^2 + 1} \cdot (2y) \\ &= \frac{10}{2y + 1} - \frac{y}{y^2 + 1} \end{aligned}$$