

- 5 1. Find the derivative of $y = (5 \ln x)^3$.

Solution. We use the Chain Rule to get:

$$\frac{dy}{dx} = 3(5 \ln x)^2 \cdot 5 \cdot \frac{1}{x} = 375 \frac{(\ln x)^2}{x} .$$

- 5 2. Let $f(x) = x^2 - 4x - 5, x < 2$. Find the value of $\frac{d}{dx} f^{-1}(x)$ at $x = -5$.
(*Hint:* Use the Derivative Rule for Inverses.)

Solution. First note that the point $(0, -5)$ is on the graph of $y = f(x)$. So $f^{-1}(-5) = 0$. Also, $f'(x) = 2x - 4$ and $f'(0) = -4$. By the Derivative Rule for Inverses,

$$\left. \frac{d}{dx} f^{-1}(x) \right|_{x=-5} = \frac{1}{f'(f^{-1}(-5))} = \frac{1}{f'(0)} = \frac{1}{-4} = -\frac{1}{4} .$$