

5.1 Compute the derivative $f'(x)$ for

$$f(x) = \log(x^4)\sin(x^3)$$

Solution.

$$f(x) = \log(x^4)\sin(x^3)$$

$$= f(x) = 4\log(x)\sin(x^3)$$

Using Product rule,

$$f'(x) = \sin(x^3)\left(\frac{d(4\log(x))}{dx}\right) + 4\log(x)\left(\frac{d\sin(x^3)}{dx}\right)$$

Now applying Chain rule,

$$f'(x) = \sin(x^3)\left(\frac{d(4\log(x))}{d(\log(x))} * \frac{d(\log(x))}{dx}\right) + 4\log(x)\left(\frac{d\sin(x^3)}{d(x^3)} * \frac{d(x^3)}{dx}\right)$$

$$f'(x) = \sin(x^3)\left(4 * \frac{1}{x}\right) + 4\log(x)(\cos(x^3) * 3x^2)$$

$$f'(x) = \frac{4\sin(x^3)}{x} + 12x^2\log(x)\cos(x^3)$$