Deriving the derivative of a given expression

Pavlov Matvey

December 15, 2023

Function:

$$f^{(0)}(x) = \frac{x^2}{x}$$

Taylor decomposition:

$$f(x) = f^{(0)}(x) + \frac{1}{1!} \cdot f^{(1)}(x) + \frac{1}{2!} \cdot f^{(2)}(x) + \frac{1}{3!} \cdot f^{(3)}(x)$$

Substitutions for Taylor:

$$f^{(0)}(x) = \frac{x^2}{x}$$

$$f^{(1)}(x) = A$$

Substitutions:

$$A = \frac{2 \cdot x \cdot x - x^2}{x \cdot x}$$

$$f^{(2)}(x) = \frac{(A) \cdot x \cdot x - B}{x \cdot x \cdot x \cdot x}$$

Substitutions:

$$A = 2 \cdot x + 2 \cdot x - 2 \cdot x$$

$$B = (2 \cdot x \cdot x - x^2) \cdot (x + x)$$

$$f^{(3)}(x) = \frac{(2 \cdot x \cdot x + (A) \cdot (x + x) - (B) \cdot (x + x) + C) \cdot x \cdot x \cdot x \cdot x - ((D) \cdot x \cdot x - E) \cdot (F)}{G}$$

Substitutions:

$$A = 2 \cdot x + 2 \cdot x - 2 \cdot x$$

$$B = 2 \cdot x + 2 \cdot x - 2 \cdot x$$

$$C = (2 \cdot x \cdot x - x^2) \cdot 2$$

$$D = 2 \cdot x + 2 \cdot x - 2 \cdot x$$

$$E = (2 \cdot x \cdot x - x^2) \cdot (x + x)$$

$$F = (x + x) \cdot x \cdot x + x \cdot x \cdot (x + x)$$

$$G = x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x$$