

# Study of the function, the value at a point and its Taylor expansion

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Function:

$$f^{(0)}(x) = \sin(15 \cdot x + 7)^3 + \cos(x^3 - 27)$$

Function value at a point  $x = 2$ :

$$f(2) = 0.722189$$

Taylor decomposition:

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

Substitutions for Taylor:

$$f^{(0)}(x) = \sin(15 \cdot x + 7)^3 + \cos(x^3 - 27)$$

$$f^{(1)}(x) = A + \sin(x^3 - 27) \cdot (-1) \cdot 3 \cdot x^2$$

Substitutions:

$$A = 3 \cdot \sin(15 \cdot x + 7)^2 \cdot \cos(15 \cdot x + 7) \cdot 15$$

$$f^{(2)}(x) = A \cdot \cos(15 \cdot x + 7) \cdot 15 + B + C + \sin(x^3 - 27) \cdot (-1) \cdot 3 \cdot 2 \cdot x$$

Substitutions:

$$A = 3 \cdot 2 \cdot \sin(15 \cdot x + 7) \cdot \cos(15 \cdot x + 7) \cdot 15$$

$$B = 3 \cdot \sin(15 \cdot x + 7)^2 \cdot \sin(15 \cdot x + 7) \cdot (-15) \cdot 15$$

$$C = \cos(x^3 - 27) \cdot 3 \cdot x^2 \cdot (-1) \cdot 3 \cdot x^2$$