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

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December 16, 2023

Function:

$$f^{(0)}(x) = \sin((x^2) \cdot \cos(x))^2$$

Function value at a point $x = 2$:

$$f(2) = 0.991229$$

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:

$$f^{(0)}(x) = \sin((x^2) \cdot \cos(x))^2$$

$$f^{(1)}(x) = 2 \cdot \sin((x^2) \cdot \cos(x)) \cdot A$$

Substitutions:

$$A = \cos((x^2) \cdot \cos(x)) \cdot (2 \cdot x \cdot \cos(x) + (x^2) \cdot \sin(x) \cdot (-1))$$

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

Substitutions:

$$A = \cos((x^2) \cdot \cos(x)) \cdot (2 \cdot x \cdot \cos(x) + (x^2) \cdot \sin(x) \cdot (-1))$$

$$B = \cos((x^2) \cdot \cos(x)) \cdot (2 \cdot x \cdot \cos(x) + (x^2) \cdot \sin(x) \cdot (-1))$$

$$C = \sin((x^2) \cdot \cos(x)) \cdot (-1) \cdot (2 \cdot x \cdot \cos(x) + (x^2) \cdot \sin(x) \cdot (-1))$$

$$D = 2 \cdot \cos(x) + 2 \cdot x \cdot \sin(x) \cdot (-1) + 2 \cdot x \cdot \sin(x) \cdot (-1) + (x^2) \cdot \cos(x) \cdot (-1)$$