



Mathematics 1 Module
Series 04 (Derivation).

Exercise 01: Determine the derivative of the following functions

$$h(x) = \frac{\cos x}{x} \quad ; \quad g(x) = \frac{x^2 - 5x}{x - 3} \quad ; \quad f(x) = 5x^4 - 15x^3 + 23$$

Exercise 02: Determine the derivative of the following functions :

$$g(x) = \frac{1}{(x^2 - 2x - 3)^3} \quad , \quad h(x) = \sqrt{x^2 - 4}, \quad f(x) = (x^3 - 5x^2 - 4)^7$$

Exercise 03: Determine the first and second derivatives of the following functions

$$h(x) = \ln(x^2 - x + 1) \quad ; \quad g(x) = \frac{e^x}{x^2 - 3x} \quad ; \quad f(x) = (x^5 - x^3 + 4)e^x$$

Exercise 04: Study the differentiability of the following functions at the corresponding points

$$\begin{aligned} f(x) &= \sqrt{x + 5} & ; & \quad x_0 = 1 \\ f(x) &= \sqrt{3x + 10} & ; & \quad x_0 = 2 \\ f(x) &= \ln(1 + |x|) & ; & \quad x_0 = 0 \end{aligned}$$

Revision exercises

1) Determine the first and second derivatives of the following functions

$$f_1(x) = \frac{1}{1+x} \quad ; \quad f_2(x) = \frac{1}{1-x} \quad ; \quad f_3(x) = xe^x$$

$$f_4(x) = (x^2 + x + 1)e^{-x} \quad ; \quad f_5(x) = \frac{1}{n!} x^n (1 + x^n) \quad ; \quad f_6(x) = \ln(x)$$

2) Consider the function

$$f(x) = \begin{cases} ax + b & , \quad x \leq 0 \\ \frac{1}{1+x} & , \quad x > 0 \end{cases}$$

For which values of a and b is $f(x)$ a continuous and differentiable function ?