



Mathematics 1 Module
Series 03 (Numerical functions).

Exercise 01: Find the domain of the following functions

$$f(x) = \sqrt{2x+1} \quad (b) \quad ; \quad f(x) = \frac{5}{4-x} \quad (a)$$
$$f(x) = \frac{3x}{\sqrt{3-x}} \quad (d) \quad ; \quad f(x) = \frac{3x^2-2}{x^2+2x-3} \quad (c)$$

$$f(x) = \sqrt{x - \sqrt{x}} \quad (e)$$

Exercise 02: Find the following limits:

$$\lim_{x \rightarrow 2} \frac{x-2}{x^2-4} \quad , \quad \lim_{x \rightarrow 0} \left(\sqrt{\frac{1}{x^2} + \frac{1}{x} + 1} - \sqrt{\frac{1}{x^2} + \frac{1}{x} - 1} \right)$$

$$\lim_{x \rightarrow +\infty} \frac{4x^4 - 2x^3 + 6}{2x^4 + 2x^2 + 3}$$

Exercise 03: Consider the functions

$$g(x) = \begin{cases} \frac{\sqrt{x-1}-1}{x-2} & \text{si } x \neq 2 \\ 2b+1 & \text{si } x = 2 \end{cases} \quad , \quad f(x) = \begin{cases} \frac{x^2-25}{x-5} & \text{si } x \neq 5 \\ 10 & \text{si } x = 5 \end{cases}$$

- 1) For which value of IR is $f(x)$ a continuous function ?
- 2) For which value of b is $g(x)$ a continuous function ?

Exercise 04:

Solve in IR the following equations :

$$1) e^{3x+2} = e \quad , \quad 2) e^x + 1 = 0 \quad ,$$

$$3) e^x (e^x - 4) = 0 \quad , \quad 4) e^{2x} + e^x - 6 = 0 \quad , \quad 5) e^{1-2\ln(x)} = 1 \quad ,$$

Exercise 05:Solve in IR the following equations :

1) $\ln(x - 1) + \ln(x - 3) = \ln(3)$, 2) $\ln(x) = 2$,

3) $(\ln(x))^2 + \ln(x) - 6 = 0$, 4) $\ln\left(\left|\frac{x-1}{2x-1}\right|\right) = 0$,

Exercise 06:Solve in IR the following inequalities :

1) $\ln(2x - 5) \geq 1$, 2) $\ln(2x + 1) \leq \ln(x + 2)$,

3) $e^{2x} - 3e^x + 2 \leq 0$.

Exercise 07 :Solve in IR the following systems :

1)
$$\begin{cases} x - y = \frac{3}{2} \\ \ln(x) + \ln(y) = 0 \end{cases}$$

2)
$$\begin{cases} 5\ln(x) + 2\ln(y) = 26 \\ 2\ln(x) - 3\ln(y) = -1 \end{cases}$$

3)
$$\begin{cases} e^x + 2e^y = 3 \\ x + y = 0 \end{cases}$$

Revision exercises**1)** Find the following limit : $\lim_{x \rightarrow +\infty} (\sqrt{x+1} - \sqrt{x})$.**2)** Consider the function

$$f(x) = \begin{cases} 3x-5 & \text{si } x < 1 \\ bx + 2 & \text{si } 1 \leq x < 4 \\ x^2 - m & \text{si } x \geq 4 \end{cases}$$

For which values of m and b is $f(x)$ a continuous function ?**3)**

a) $e^x - 7 = 0$, b) $\ln(e^x - 3) = 0$, c) $\ln(2x + 5) = \ln(x + 6)$,

d) $\ln(|x - 1|) = \ln(|2x - 1|)$.