Mohamed Khider Biskra University   **Module: Biostat**
Faculty of Exact Sciences and SNV   **university year:2023/2024**
Biology department   **Level: $1^{\acute{e}re}$Licence**

Serie N01

Exercise 01: Determine the domain for each of the following functions (le domaine de définition):

1. $f_1(x) = \sqrt{x - x^3}$; 2. $f_2(x) = \sqrt[3]{x+1}$; 3. $f_3(x) = \frac{1}{4-x^2}$.

4. $f_4(x) = \frac{1}{\sqrt{4-x^2}}$; 5. $f_5(x) = \ln(\frac{2+x}{2-x})$; 6. $f_6(x) = \sqrt{\frac{x^2-2}{(x-1)(x+1)}}$

Exercise 02: Find the limit of the following functions:

1. $\lim\limits_{x \to 4}\frac{3-\sqrt{x+5}}{1-\sqrt{5-x}}$; 2. $\lim\limits_{x \to +\infty}(\sqrt{x^2+4x+3} - (x+2))$; 3. $\lim\limits_{x \to 0}x\sin(\frac{1}{x})$.

4. $\lim\limits_{x \to +\infty}(3x^2 - x^2\sin(x))$; 5. $\lim\limits_{x \to 0}\frac{1-\exp(x)}{1-x}$; 6. $\lim\limits_{x \to 0}\frac{\exp(x)-1}{\ln(x+1)}$.

Exercise 03:

I- Discuss (Etudier) the continuity of the following functions:

1. $f_1(x) = \frac{x^2}{x-2}$;

2. $f_2(x) = \ln\left(\frac{2+x}{2-x}\right)$

II- Can we extend by continuity at the point $x_0 = 0$ the following functions. (Peut-on prolonger par continuité au point $x_0 = 0$ les fonctions suivantes):

1. $g(x) = \frac{1-\cos(x)}{x^2}$;

2. $h(x) = \frac{\exp(x) - \exp(-x)}{x}$

Exercise 04: Let f a function defined by:

$$
\begin{cases}
\frac{2x}{1+x^2} & \text{if } x \in [-1, 0[\\
\\
\sqrt{x} & \text{if } x \in [0, 3]
\end{cases}
$$

1. Determine if the function f is continuous and differentiable at the points: $x_0 = -1, x_0 = 0$ and $x_0 = 3$.

2. Discuss the continuity and differentiability of f in its domain of definition.

3. Determine $f'(x)$ at the points where it is differentiable.