$$
\begin{aligned}
& \text { University of Annaba-Department of Technology } \\
& \text { Second year undergraduation } \\
& \text { Analysis } \\
& \text { Supplementary problems } \\
& \text { Series }
\end{aligned}
$$

$$
2009-2010
$$

Exercise 1. $\quad$ Study the convergence of the following serie when $x=0$ :

$$
\begin{equation*}
\frac{4-x}{7 x+2}+\frac{1}{3}\left(\frac{4-x}{7 x+2}\right)^{2}+\frac{1}{5}\left(\frac{4-x}{7 x+2}\right)^{3} \tag{1}
\end{equation*}
$$

Exercise 2. Find the domain of convergence of the following series:
1.

$$
\begin{equation*}
\sum_{n \geq 1} \frac{n x}{1+n x} \tag{2}
\end{equation*}
$$

2. 

$$
\begin{equation*}
\sum_{n \geq 1} \exp -n x \tag{3}
\end{equation*}
$$

3. 

$$
\begin{equation*}
\sum_{n \geq 0} \frac{x^{2}}{\left(1+x^{2}\right)^{n}} \tag{4}
\end{equation*}
$$

4. 

$$
\begin{equation*}
\sum_{n \geq 1} \frac{(-1)^{n}}{(x+3)^{n}} \tag{5}
\end{equation*}
$$

## Exercise 3.

1. Study the uniform convergence of the following serie on the interval $[-2,-1]$ :

$$
\begin{equation*}
\sum_{n \geq 1} \frac{x}{(1+(n-1) x)(1+n x)} \tag{6}
\end{equation*}
$$

2. Use the Weierstrass criteria to study the uniform convergence of

$$
\begin{gather*}
\sum_{n \geq 1} \frac{x^{n}}{n} .  \tag{7}\\
\sum_{n \geq 1} \frac{\cos (n x+1)}{n^{2}+1} . \tag{8}
\end{gather*}
$$

Exercise 4. Compute the sum of the following series:
1.

$$
\begin{equation*}
\sum_{n \geq 1} n x^{n-1} \tag{9}
\end{equation*}
$$

2. 

$$
\begin{equation*}
\sum_{n \geq 1} \frac{x^{n}}{n} \tag{10}
\end{equation*}
$$

