

### Series 03: Power series

**Exercise 01 :** Determine the radius and the interval of convergence of the series  $\sum_{n=0}^{\infty} a_n x^n$  in the following cases:

- $a_n = \ln(1 + \sin(\frac{1}{n}))$ ,
- $a_n = e^{-n^2}$ .

**Exercise 02 :** Find a power series expansion for the functions:

- $f_n(x) = \frac{2x - 1}{(x - 1)(x - 2)}$ ,
- $f_n(x) = \ln(x^2 - 5x + 6)$ ,
- $f_n(x) = \int_0^x \frac{\sin t}{t} dt$ .

**Exercise 03 :** Determine the radius of converge  $R$  and the sum of the series:

- $\sum_{n=0}^{\infty} \frac{n}{n-1} x^n$ ,
- $\sum_{n=0}^{\infty} (-1)^n \frac{x^{2n}}{(2n+1)!}$ ,
- $\sum_{n=0}^{\infty} \frac{n^2 x^n}{n!}$ .