

Series N°3: Numerical integrations

**Exercise 1**

Find the integral of the function  $f(x)$  defined by the following table:

$x$	1	1.2	1.4	1.6	1.8
$f(x)$	1.543	1.811	2.151	2.577	3.107

- Using the simple then generalized trapezoidal method.
- Using the simple then generalized Simpson's method.
- Discuss the results.

**Exercise 2**

Let the integral of the function  $\int_0^{\pi/4} tg(x) dx$ .

- 1- Use the trapezoidal method for  $n = 4$ , then  $n = 8$ , to find an approximation of this integral.
- 2- Compare the results with the exact (analytical) value of the integral.

**Exercise 3**

Using the trapezoid method, calculate the approximate value of  $I = \int_0^{\pi} \sin(x^2) dx$  for  $n=5$ ; then  $n=10$

**Exercise 4**

For  $f(x) = \int_0^x te^{-t} dt$  How many subdivisions of  $[0,1]$  are needed to evaluate  $f(1)$  with a precision of  $10^{-8}$ :

- 1- Using the trapezoid method.
- 2- Using Simpson's method.

**Exercise 5 (for students):**

For  $F(t) = \int_0^t \frac{dt}{1+t^2}$

- 1 - For  $n=10$ , calculate  $F(3)$  using the trapezoid method.
- 2- Estimate the error made in calculating this value if we use the trapezoidal method and the Simpson method.