3d (C). Work by Gravitational Force

- [work_grav.cpp] A satellite is falling on Earth following a spiral-like orbit with equation:

$$r(\theta) = \frac{r_0}{\sqrt{1 + (\theta/b)^4}}$$

where b=π.

- Using its standard definition ($W = \int \mathbf{F}\cdot d\mathbf{s}$), compute the work done by the gravitational force on the satellite for $\theta \in [0, 4\pi]$ using Gaussian (n_{gauss}=3) and trapezoidal methods. In particular, determine the number of sub-intervals nsub = 4, 8, 16, ... until the error

$\varepsilon = |W_{nsub} - W_{nsub/2}|$

(where W_{nsub} is the work obtained by integrating on nsub intervals) falls below a given tolerance, i.e., → $\varepsilon <$ tol, with tol = 1.e-6. Assume r_0 = GMm = 1.

- Do you have an analytical solution for this problem ? Use it as a comparison.
- Upload you code with i) the output inserted in the comments at the beginning of the file, ii) the required library function at the end, e.g.

```
// Name: Your name
// Date: 02 Nov 2023
//
// Code output:
// ******************************************************
// Trapezoidal:  n = ??; Wx = ??; Wy = ??; Wtot = Wx + Wy = ??
// Gaussian Int  n = ??; Wx = ??; Wy = ??; Wtot = Wx + Wy = ??
// (Exact = ??)
// ******************************************************
#include ...
...
int main()
{
  // code here
}

void Trapezoidal(...){

}

void  Gauss(..){

}
```