

Quadrature formula

In numerical analysis, a quadrature rule is used to approximate definite integral of a function.

Requirements

It is required to write a program which allows to compute integrals on convex polygons.

More precisely, given the Gauss-Legendre quadrature formula on $[-1,1]$, it is required to implement

- A method “MapQuadrature1D” which allows to compute integrals on a generic interval $[a,b]$;
- A method “ReferenceSquareQuadrature2D” which allows to compute integrals on the reference square $[0,1] \times [0,1]$;
- A method “ReferenceTriangleQuadrature2D” which allows to compute integrals on the reference triangle of vertices $(0,0)$, $(1,0)$ and $(0,1)$;
- A method “PolygonTriangulationByFirstVertex” which allows to triangulate convex polygons in such a way to generate the smallest number of triangles;
- A method “PolygonQuadrature2D” which allows to compute integrals on convex polygons;

and to define

- A class “Triangle” which defines methods to map the reference triangle of vertices $(0,0)$, $(1,0)$ and $(0,1)$ into a generic triangle.