Gauss Legendre quadrature over a triangle

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Abstract

This paper presents a Gauss Legendre quadrature method for numerical integration over the standard triangular surface: $\{(x, y) \mid 0 \le x, y \le 1, x + y \le 1\}$ in the Cartesian two-dimensional (x, y) space. Mathematical transformation from (x, y) space to (x, h) space map the standard triangle in (x, y) space to a standard 2-square in (x, h) space: $\{(x, h) | -1 \le x, h \le 1\}$. This overcomes the difficulties associated with the derivation of new weight coefficients and sampling points and yields results which are accurate and reliable. Results obtained with new formulae are compared with the existing formulae.

Keywords: Finite-element method, numerical integration, Gauss Legendre quadrature, triangular elements, standard 2-square, extended numerical integration.