Home Work - Assignment 3

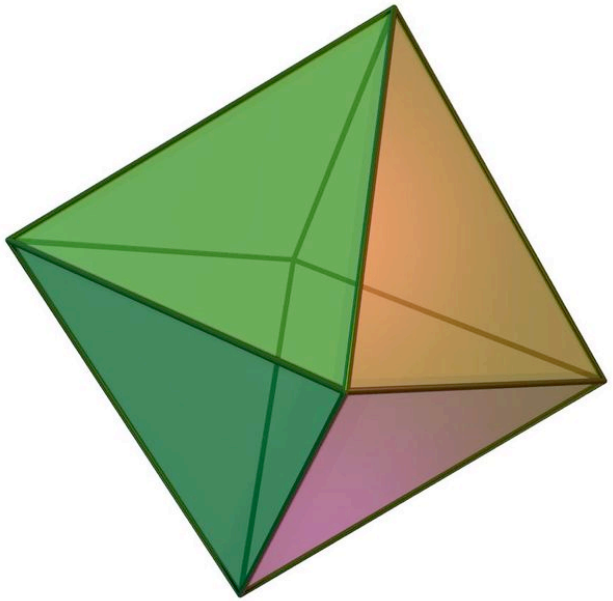
Finite Element Methods

Shape Functions

CVRTI

Finite Element Method: Octahedron

1. Define node positions for a unit octahedron
   Hint: Set node 0 to position 0,0,0
2. Develop an interpolation function
   a. Select a suitable polynomial
      Hint: Add internal node at 0.5,0.5,0
   b. Create a linear system which fulfills the node conditions
      Hint: It will be sufficient to choose a linear system with a dimension identical to the number of nodes
   c. Invert the linear system to obtain the interpolation function
   d. Extract the shape functions



CVRTI

Finite Element Method: Octahedron

3. Develop a Gaussian quadrature scheme to solve without error

$$I = \int_V f(x,y,z)\, dV$$

$$f(x,y,z) = a + bx + cy + dz$$

What are the weights and where are the quadrature points?

4. Why are octahedral elements rarely applied in Finite Element models?

Hint: Use Matlab or Mathematica!