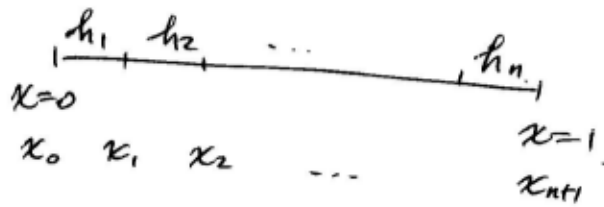


# Homework

1. Given 1-d finite element mesh

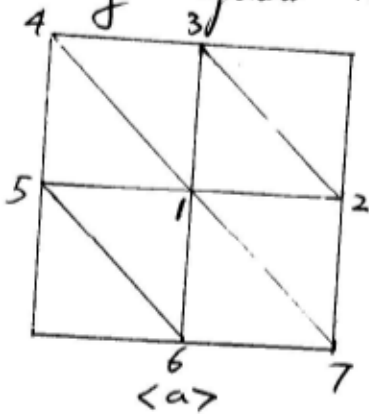


$x_i - x_{i-1} = h_i$ , formulate the Galerkin finite element method for  $\begin{cases} -u_{xx} = f \\ u = 0, \quad x=0, 1 \end{cases}$

Calculate  $A_n = \{a(\varphi_i, \varphi_j)\}$  in terms of  $\{h_i\}$ .

2. Consider  $\begin{cases} -\Delta u = f & \text{in } 2\text{-D,} \\ u = g \end{cases}$  we have the

following regular triangulation,  $\langle a \rangle$ , if we index the



nodes as shown in the picture, compute the entries

$$a(\varphi_i, \varphi_j) \quad i=2,3,\dots,7.$$

$\varphi_i$  is the piecewise linear nodal basis at node  $x_i$ .

Compare with 5-point <sup>finite</sup> difference method. Furthermore,

calculate  $a(\varphi_i, \varphi_j)$  for the triangulation in (b), and do

the comparison.

