Sec. 5.3 Formulation of Continuum Elements

\[
\begin{align*}
    h_1 & = g_1 - (g_8 + g_{12} + g_{13})/2 \\
    h_2 & = g_2 - (g_9 + g_{10} + g_{13})/2 \\
    h_3 & = g_3 - (g_{10} + g_{11} + g_{12})/2 \\
    h_4 & = g_4 - (g_{11} + g_{12} + g_{20})/2 \\
    h_5 & = g_5 - (g_{12} + g_{13} + g_{20})/2 \\
    h_6 & = g_6 - (g_9 + g_{14} + g_{15})/2 \\
    h_7 & = g_7 - (g_{14} + g_{15} + g_{16})/2 \\
    h_8 & = g_8 - (g_{15} + g_{16} + g_{20})/2 \\
    h_9 & = g_9 - (g_{16} + g_{20} + g_{25})/2 \\
    h_{10} & = g_{10} - (g_{20} + g_{25} + g_{30})/2 \\
    g_i & = 0 \text{ if node } i \text{ is not included; otherwise,} \\
    g_i & = G(t, r) G(s, x) G(t, x) \\
    G(\beta, \beta) & = \frac{1}{2} (1 + \beta, \beta) \text{ for } \beta = \pm 1 \\
    G(\beta, \beta) & = (1 - \beta^2) \text{ for } \beta = 0 \\
    \beta & = r, \ s, \ t \\
\end{align*}
\]

(b) Interpolation functions

Figure 5.5 (continued)

Node 1 0.3L 0.5L 0.2L Node 2

\[x = -1 \quad x = 0 \quad x = 1\ldots \text{3-node case} \quad x = 1\ldots \text{4-node case}\]

(a) 2 to 4 variable-number-nodes truss element

(b) Interpolation functions

Figure 5.3 Interpolation functions of two to four variable-number-nodes one-dimensional element