



Date: _____

Class: _____

Assignment: _____

global

$$l_{e_i} = x_{in} - x_i$$

local

$$\phi_i = \frac{x_{in} - x}{l_{e_i}}, \quad \phi_{in} = \frac{x - x_i}{l_{e_i}}$$

$$\Omega_1 = \frac{1}{2}(1 - \xi), \quad \Omega_2 = \frac{1}{2}(1 + \xi)$$

coord transform $x = x_i \left(\frac{1 - \xi}{2} \right) + x_{in} \left(\frac{1 + \xi}{2} \right) \quad \text{for } e_i$

$$\frac{dx}{d\xi} = \frac{x_{in} - x_i}{2} = \frac{l_{e_i}}{2}, \quad \frac{d\xi}{dx} = \frac{2}{l_{e_i}}$$

Common Integrals over e_i :

conversion factor local $\rightarrow$ global

To convert Back to global $\langle e_i \rangle$

$$1 \quad \langle \phi_i, \phi_i \rangle^{e_i} = \frac{l_{e_i}}{3}$$

$$\frac{dx}{d\xi}$$

$$\langle \Omega_1, \Omega_1 \rangle = \frac{2}{3}$$

$$\cdot \frac{l_{e_i}}{2}$$

$$2 \quad \langle \phi_i, \phi_{in} \rangle^{e_i} = \frac{l_{e_i}}{6}$$

$$\frac{dx}{d\xi}$$

$$\langle \Omega_1, \Omega_2 \rangle = +\frac{1}{3}$$

$$\cdot \frac{l_{e_i}}{2}$$

$$- \quad \langle \phi_{in}, \phi_{in} \rangle^{e_i} = \frac{l_{e_i}}{3}$$

$$\frac{dx}{d\xi}$$

$$\langle \Omega_2, \Omega_2 \rangle = \frac{2}{3}$$

$$\cdot \frac{l_{e_i}}{2}$$

$$3 \quad \langle \phi'_i, \phi'_i \rangle^{e_i} = \frac{1}{l_{e_i}}$$

$$\frac{d\xi}{dx}$$

$$\langle \Omega'_1, \Omega'_1 \rangle = \frac{1}{2}$$

$$\cdot \frac{2}{l_{e_i}}$$

$$4 \quad \langle \phi'_i, \phi'_{in} \rangle^{e_i} = -\frac{1}{l_{e_i}}$$

$$\frac{d\xi}{dx}$$

$$\langle \Omega'_1, \Omega'_2 \rangle = -\frac{1}{2}$$

$$\cdot \frac{2}{l_{e_i}}$$

$$- \quad \langle \phi'_{in}, \phi'_{in} \rangle^{e_i} = \frac{1}{l_{e_i}}$$

$$\frac{d\xi}{dx}$$

$$\langle \Omega'_2, \Omega'_2 \rangle = \frac{1}{2}$$

$$\cdot \frac{2}{l_{e_i}}$$

$$5 \quad \langle \phi_i \rangle^{e_i} = \frac{l_{e_i}}{2}$$

$$dx/d\xi$$

$$\langle \Omega_1 \rangle = 1$$

$$\cdot \frac{l_{e_i}}{2}$$

$$\langle \phi_{in} \rangle^{e_i} = \frac{l_{e_i}}{2}$$

$$dx/d\xi$$

$$\langle \Omega_2 \rangle = 1$$

$$\cdot \frac{l_{e_i}}{2}$$