



## 4.6 Exercises

**4-2** Two-dimensional element of triangle with three nodes.

(1) Using the equations of shape functions, verify the following:

$$N_a(x_b, y_b) = \delta_{ab} = \begin{cases} 1, & a = b \\ 0, & a \neq b \end{cases} \quad \sum_{a=1}^3 N_a(x, y) = 1$$

(2) Using the equations of shape functions, compute the following derivatives:

$$\frac{\partial N_a}{\partial x}, \frac{\partial N_a}{\partial y}, \frac{\partial^2 N_a}{\partial xy}, \frac{\partial^2 N_a}{\partial x^2}, \frac{\partial^2 N_a}{\partial y^2}, \quad a = 1, 2, 3$$