Special functions such as the *Kronecker delta function* also benefit from indicial notation:

$$\delta_{ij} = \begin{cases} 0 & \text{for } i \neq j \\ 1 & \text{for } i = j \end{cases} \qquad i, j = 1, 2, 3 \tag{2.1.4}$$

Throughout this text we assume the *Einstein summation notation*, in which repetition of indices within a term explicitly requires summation on that term. Thus, for a term such as

$$\Delta = \varepsilon_{11} + \varepsilon_{22} + \varepsilon_{33} = \varepsilon_{nn} \tag{2.1.5}$$

the repeated index n implies summation. This holds for repeated indices within any single term:

$$x_i y_i = x_1 y_1 + x_2 y_2 + x_3 y_3$$

$$y_{i,i} = \frac{\partial y_1}{\partial x_1} + \frac{\partial y_2}{\partial x_2} + \frac{\partial y_3}{\partial x_3} \tag{2.1.6}$$

When a single equation is written with indicial notation, generally a set of equations is implied, as the indices assume all of their permutations. For example, the generalized, linear, isotropic, elastic Hooke's law relating stress (σ_{ij}) and strain (ε_{ij}) terms is given by nine equations:

$$\sigma_{11} = \lambda(\varepsilon_{11} + \varepsilon_{22} + \varepsilon_{33}) + 2\mu\varepsilon_{11}$$

$$\sigma_{12} = 2\mu\varepsilon_{12}$$

$$\sigma_{13} = 2\mu\varepsilon_{13}$$

$$\sigma_{21} = 2\mu\varepsilon_{21}$$

$$\sigma_{22} = \lambda(\varepsilon_{11} + \varepsilon_{22} + \varepsilon_{33}) + 2\mu\varepsilon_{22} \tag{2.1.7}$$

$$\sigma_{23} = 2\mu\varepsilon_{23}$$

$$\sigma_{31} = 2\mu\varepsilon_{31}$$

$$\sigma_{32} = 2\mu\varepsilon_{32}$$

$$\sigma_{33} = \lambda(\varepsilon_{11} + \varepsilon_{22} + \varepsilon_{33}) + 2\mu\varepsilon_{33},$$

which can be written as

$$\sigma_{ij} = \lambda(\varepsilon_{kk})\delta_{ij} + 2\mu\varepsilon_{ij}, \tag{2.1.8}$$

where it is assumed that all terms $i, j = 1, 2, 3$ are explicitly considered.