sary in order to solve specific problems of engineering interest, and these processes are the subject of the next chapter.

References

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Exercises

4-1. Explicitly justify the symmetry relations (4.2.4). Note that the first relation follows directly from the symmetry of the stress, while the second condition requires a simple expansion into the form $\sigma_{ij} = \frac{1}{2}(C_{ijkl} + C_{ijlk})e_{lk}$ to arrive at the required conclusion.

4-2. Substituting the general isotropic fourth-order form (4.2.6) into (4.2.3), explicitly develop the stress-strain relation (4.2.7).

4-3. Following the steps outlined in the text, invert the form of Hooke's law given by (4.2.7) and develop form (4.2.10). Explicitly show that $E = \mu(3\lambda + 2\mu)/(\lambda + \mu)$ and $\nu = \lambda/[2(\lambda + \mu)]$.

4-4. Using the results of Exercise 4-3, show that $\mu = E/[2(1 + \nu)]$ and $\lambda = E\nu/[(1 + \nu)(1 - 2\nu)]$.

4-5. For isotropic materials show that the principal axes of strain coincide with the principal axes of stress. Further, show that the principal stresses can be expressed in terms of the principal strains as $\sigma_i = 2\mu e_i + \lambda e_{kk}$.

4-6. A rosette strain gage (see Exercise 2-7) is mounted on the surface of a stress-free elastic solid at point O as shown in the following figure. The three gage readings give surface extensional strains $e_a = 300 \times 10^{-6},\ e_b = 400 \times 10^{-6},\ e_c = 100 \times 10^{-6}$. Assuming that the material is steel with nominal properties given by Table 4-2, determine all stress components at O for the given coordinate system.