Exercise 1.7.1
Show that the orthogonality conditions ⇒ det[λ_{ij}] = ±1

Exercise 1.7.2
Use the transformation rules and the orthogonality conditions to show that for any vector \( u \) and any frames \( X \) and \( X' \), \( u'_k u'_k = u_k u_k \).
which is consistent with the fact that each of these is \( |u|^2 \).

Exercise 1.7.3
Use the orthogonality conditions to prove that: \( u'_i = λ_{ij} u_j ⇔ u_i = λ_{ji} u'_j \)

Exercise 1.7.4
Prove that the transpose of an orthogonal matrix is also orthogonal.

Exercise 1.8.1
Prove that: \( v \cdot u = u \cdot v \)

Exercise 1.8.2
Prove that: \( (λu) \cdot v = λ(u \cdot v) \)

Exercise 1.8.3
Prove that: \( u \cdot u = |u|^2 \)

Exercise 1.8.4
Prove Theorem 1.8.4

Exercise 1.8.5
In view of Theorem 1.8.2, \( e_i \cdot e_j = δ_{ij} \). Use this fact to establish the orthogonality conditions of Theorem 1.7.2.

Exercise 1.8.6
Prove Theorem 1.8.5