1.2) Derive the cyclicity (1.24) of the trace from Eq. (1.23).

1.3) Show that $(AB)^{\mathrm{T}} = B^{\mathrm{T}}A^{\mathrm{T}}$, which is Eq. (1.26).

1.5) Show that $(AB)^{\dagger} = B^{\dagger}A^{\dagger}$, which is Eq. (1.29).

1.7) Show that the two 4×4 matrices (1.46) satisfy Grassman's algebra (1.11) for $n = 2$.

1.12) Show that the Minkowski product $(x, y) = \vec{\mathbf{x}} \cdot \vec{\mathbf{y}} - x^0 y^0$ of two 4-vectors x and y is an inner product obeying the rules (1.78,1.79,1.84).

1.18) Use the Gram-Schmidt method to find orthonormal linear combinations of the three vectors

$$\vec{\mathbf{s}}_1 = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}, \quad \vec{\mathbf{s}}_1 = \begin{pmatrix} 1 \\ 1 \\ 0 \end{pmatrix}, \quad \vec{\mathbf{s}}_3 = \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}. \tag{1}$$

1.21) Show that a linear operator A that is represented by a hermitian matrix (1.167) in an orthonormal basis satisfies $(g, Af) = (Ag, f)$. 1 g