

Exercise 4

A vector \mathbf{v} has components

$$v_i = \sum_{j=1}^3 \alpha_{ij} x_j$$

with $\alpha_{ij} = \alpha_{ji}$ and $\sum_{i=1}^3 \alpha_{ii} = 0$; the α_{ij} are constants. Evaluate $(\nabla \cdot \mathbf{v})$, $[\nabla \times \mathbf{v}]$, $\nabla \mathbf{v}$, $(\nabla \mathbf{v})^\dagger$, and $[\nabla \cdot \mathbf{v}\mathbf{v}]$. (*Hint*: In connection with evaluating $[\nabla \times \mathbf{v}]$, see Exercise 5 in §A.2.)