Vector Identity 13

$$\nabla \times \mathbf{x} = 0$$

Proof

$$\begin{aligned}
\nabla \times \mathbf{x} &= \left(\sum_{i=1}^{3} \boldsymbol{\delta}_i \frac{\partial}{\partial x_i} \right) \times \left(\sum_{j=1}^{3} \boldsymbol{\delta}_j x_j \right) \\
&= \sum_{i=1}^{3} \sum_{j=1}^{3} (\boldsymbol{\delta}_i \times \boldsymbol{\delta}_j) \frac{\partial x_j}{\partial x_i} \\
&= \sum_{i=1}^{3} \sum_{j=1}^{3} (\boldsymbol{\delta}_i \times \boldsymbol{\delta}_j) \delta_{ij} \\
&= \sum_{i=1}^{3} (\boldsymbol{\delta}_i \times \boldsymbol{\delta}_i) \\
&= \mathbf{0}
\end{aligned}$$