Problems: Del Notation; Flux

1. Verify the divergence theorem if $\mathbf{F} = x\mathbf{i} + y\mathbf{j} + z\mathbf{k}$ and S is the surface of the unit cube with opposite vertices $(0, 0, 0)$ and $(1, 1, 1)$.

2. Prove that $\dfrac{1}{2}\boldsymbol{\nabla}(\mathbf{F} \cdot \mathbf{F}) = \mathbf{F} \times (\boldsymbol{\nabla} \times \mathbf{F}) + (\mathbf{F} \cdot \boldsymbol{\nabla})\mathbf{F}$, where $\langle P, Q, R \rangle \cdot \boldsymbol{\nabla}$ is the differential operator $P\frac{\partial}{\partial x} + Q\frac{\partial}{\partial y} + R\frac{\partial}{\partial z}$.

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