Homework 1

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3.5.9

To show that

$$\nabla \cdot \left(\vec{a} \times \vec{b}\right) = \vec{b} \cdot (\nabla \times \vec{a}) - \vec{a} \cdot \left(\nabla \times \vec{b}\right)$$

We can use a similar proof to showing the $BAC - CAB$ rule, utiziling the Levi-Cevita symbol.

$$\nabla \cdot \left(\vec{a} \times \vec{b}\right) = \sum_i \nabla_i \cdot \sum_{jk} \epsilon_{ijk} a_j b_k$$

$$= \sum_i$$

3.6.7

The identity

$$\boldsymbol{A} \times (\nabla \times \boldsymbol{A}) = \frac{1}{2}\nabla \left(A^2\right) - (\boldsymbol{A} \cdot \nabla)\, \boldsymbol{A}$$

Can be verified by making note of the fact that $A^2 = \boldsymbol{A} \cdot \boldsymbol{A}$, letting us say

$$= \frac{1}{2}\nabla (\boldsymbol{A} \cdot \boldsymbol{A}) - (\boldsymbol{A} \cdot \nabla)\, \boldsymbol{A}$$

$$=$$

3.6.9

3.8.10

3.10.4

3.10.10