• We wish to prove $\vec{\nabla} \times (\phi \vec{F}) = \nabla\phi \times \vec{F} + \phi\, \vec{\nabla} \times \vec{F}$

$$\vec{\nabla} \times (\phi \vec{F}) = \varepsilon_{ijk}\, \partial_j (\phi F_k)$$

$$= \varepsilon_{ijk} (\partial_j \phi) F_k + \varepsilon_{ijk}\, \phi\, \partial_j F_k$$

$$= \vec{\nabla}\phi \times \vec{F} + \phi (\vec{\nabla} \times \vec{F})$$