• We wish to expand $\vec{\nabla} \times (\vec{\nabla} \times \vec{F})$

$$\vec{\nabla} \times (\vec{\nabla} \times \vec{F}) = \varepsilon_{ijk} \partial_j \{ \vec{\nabla} \times \vec{F} \}_k$$

$$= \varepsilon_{ijk} \partial_j \varepsilon_{klm} \partial_l F_m$$

$$= \varepsilon_{kij} \varepsilon_{klm} \partial_j \partial_l F_m$$

$$= (\delta_{il} \delta_{jm} - \delta_{im} \delta_{jl}) \partial_j \partial_l F_m$$

$$= \partial_j \partial_i F_j - \partial_j \partial_j F_i$$

$$= \vec{\nabla} (\vec{\nabla} \cdot \vec{F}) - \nabla^2 \vec{F}$$