Special Problem A-4

(a) Prove the identity assuming \boldsymbol{a} is a vector in \mathbb{R}^3 in Cartesian coordinates.

$$\nabla \cdot (\nabla \times \boldsymbol{a}) = 0$$

(b) Prove the identity assuming ∇f is a vector in \mathbb{R}^3 in Cartesian coordinates.

$$\nabla \times \nabla \boldsymbol{f} = \boldsymbol{0}$$

(c) Prove the identity

$$abla \cdot (oldsymbol{a} imes oldsymbol{b}) = (
abla imes oldsymbol{a}) \cdot oldsymbol{b} - (
abla imes oldsymbol{b}) \cdot oldsymbol{a}$$