

• We wish to prove the operator identity

$$\int dS \hat{n} \circ q \stackrel{?}{=} \int dV \vec{\nabla} \circ q$$

where ' \circ ' is any allowed product (ordinary, dot, or cross) and q is a compatible scalar or vector.

a) From Gauss' theorem

$$\int dS \hat{n} \cdot \vec{F} = \int dV \vec{\nabla} \cdot \vec{F}$$

b) From I01

$$\int dS \hat{n} \times \vec{F} = \int dV \vec{\nabla} \times \vec{F}$$

c) From I02

$$\int dS \hat{n} \phi = \int dV \vec{\nabla} \phi$$

QED