

The fundamental theorem for Divergences. States that:

$$\int_V (\nabla \cdot \vec{F}) dv = \oint_S \vec{F} \cdot d\vec{s}$$

This theorem has at least three special names:

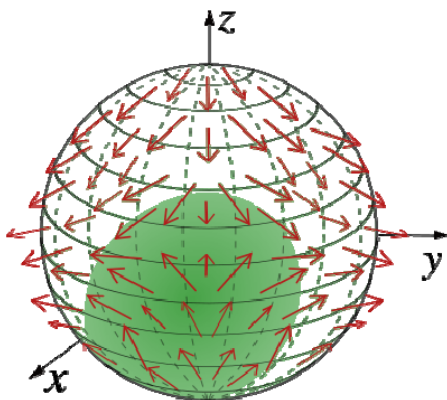
Gauss's theorem, Green's theorem, or, simply, the divergence theorem.

This theorem says that the integral of a derivative (in this case the divergence) over a volume is equal to the value of the function at the surface that bounds the volume.

Geometrical interpretation:

If \vec{F} represents the flow of an incompressible fluid the flux of \vec{F} is the total current of fluid passing out through the surface, per unit time. Now, the divergence measures the "spreading out" of the vectors from a point—a place of height divergence is like a "faucet", pouring out liquid.

$$\int_V (\text{faucets within the volume}) = \oint_S (\text{flow out through the surface})$$



A vector field on a sphere (this is not the field in the example)