Final Exam Notes

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Divergence Theorem

The diverence theorem relates a flux integral of vector field F over a closed surface S to a triple integral of the divergence of F over the solid that S encloses

In 2 dimensions, also the flux form of Green's theorem, divergence theorem is

$$\iint\limits_{T} \nabla \cdot \vec{F}\, dV = \int\limits_{\partial T} \vec{F} \cdot \vec{n}\, ds$$

And in 3 dimensions, the actual divergence theorem

$$\iiint\limits_{R} \nabla \cdot \vec{F}\, dV = \iint\limits_{\partial R} \vec{F} \cdot \vec{n}\, dS$$

In this scenario, the ∂ symbol next to a set denotes the boundaries of a set. Also, the normal vectors represent the outward orientation of the unit vector.

Stoke's Theorem

Definition:

The flux of curl F across a surface S can be found with only information about the values of F along the boundary of S. Also, we can calculate the line integral of vector field F along the boundary of the surface S by translating to a double integral of the curl of F over S

$$\iint\limits_S (\nabla \times \vec{F}) \cdot \vec{n}\, dS = \int\limits_{\partial S} \vec{F} \cdot d\vec{r}$$