

Math 240: More of Divergence Theorem

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Outline

1 Today's Goals

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- 1 Understand how to use the Divergence Theorem.
- 2 Understand why the Divergence Theorem is true.

Divergence Theorem

Theorem

Let D be a **closed and bounded** region in 3-space with a **piecewise smooth** boundary S that is oriented outward. Let $F(x, y, z) = P(x, y, z)\mathbf{i} + Q(x, y, z)\mathbf{j} + R(x, y, z)\mathbf{k}$ be a vector field for which P , Q and R are continuous and have continuous first partial derivatives in a region of 3-space containing D . Then

$$\int \int_S (F \circ \mathbf{n}) dS = \int \int \int_D \operatorname{div}(F) dV$$

where \mathbf{n} is the unit normal vector to S .