

Divergence theorem

- ∇ (nabla) operator
 - How to define divergence?
 - What are the properties of ∇ operators?

Divergence theorem

- What is a divergence of a vector field?
- What is a divergence theorem?
- What is a meaning of divergence of a vector field?

Homework

- Reading assignment
 - Chapter §3.4 – §4.3.
- Writing assignment (due **Nov. 2nd, 11:59pm**)

Let $\mathbf{F}(x, y, z) = (P(x, y, z), Q(x, y, z), R(x, y, z))$, $\mathbf{G} = (U(x, y, z), V(x, y, z), W(x, y, z))$ are vector fields on \mathbf{R}^3 .

 1. Write the following formula explicitly in terms of P, Q, R, U, V, W .
 - (a) $\nabla \cdot (F + G)$
 - (b) $\nabla \times (F + G)$
 - (c) $\nabla \cdot (F \times G)$
 - (d) $\nabla \times (F \times G)$
 2. Let $f : \mathbf{R}^3 \rightarrow \mathbf{R}$ be a differentiable function. Prove the following identity.
 - (a) $\nabla \cdot (f\mathbf{F}) = f\nabla \cdot \mathbf{F} + \nabla f \cdot \mathbf{F}$
 - (b) $\nabla \times (f\mathbf{F}) = f\nabla \times \mathbf{F} + \nabla f \times \mathbf{F}$
 3. Explain the meaning of the following statement.
 - (a) A surface is closed.
 - (b) A surface is oriented.
 4. Explain the divergence theorem explicitly. (No need to prove.)