



planetmath.org

Math for the people, by the people.

vector potential

Canonical name	VectorPotential
Date of creation	2013-03-22 15:42:54
Last modified on	2013-03-22 15:42:54
Owner	pahio (2872)
Last modified by	pahio (2872)
Numerical id	8
Author	pahio (2872)
Entry type	Definition
Classification	msc 26B12
Related topic	IntegrationWithRespectToSurfaceArea
Related topic	LaminarField
Related topic	KalleVaisala

Let $\vec{U} = \vec{U}(x, y, z)$ be a vector field in \mathbb{R}^3 with continuous partial derivatives. Then the following three conditions are <http://planetmath.org/Equivalent3equivalent>:

- The surface integrals of \vec{U} over all contractible <http://planetmath.org/Sphereclosed> surfaces S vanish:

$$\oint_S \vec{U} \cdot d\vec{S} = 0$$

- The divergence of \vec{U} vanishes everywhere in the <http://planetmath.org/VectorFieldfield>:

$$\nabla \cdot \vec{U} = 0$$

- There exists the *vector potential* $\vec{A} = \vec{A}(x, y, z)$ of \vec{U} :

$$\nabla \times \vec{A} = \vec{U}$$

References

- [1] K. VÄISÄLÄ: *Vektorianalyysi*. Werner Söderström Osakeyhtiö, Helsinki (1961).