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For D-1.

Vector Analysis

Scalar :- A scalar is a quantity having magnitude but no direction, eg: mass, length, time, temp. & any real numbers. Scalars are indicated by letters in ordinary type as in elementary algebra. Operations with scalars follow the same rules as in elementary algebra.

Vectors :- A vector is a quantity having both magnitude and directions. Graphically a vector is represented by an arrow defining the direction, the magnitude of vector be indicated by the length of the arrow. Analytically vector is represented by a letter with an arrow over it, as $\vec{A}$ & its magnitude by $|\vec{A}|$.

Scalar ~~field~~ field : If each point (x, y, z) of a region R in space there corresponds a number or scalar $\phi(x, y, z)$, then ϕ is called a scalar fn. of position or scalar point fn. and we say that scalar field ϕ has been defined in R.

Exam :- The temp. at any point within or on the earth's surface at a certain time defines a scalar ~~field~~ field.

Vector field : If each point (x, y, z) of a region R in space there corresponds a vector $\vec{v}(x, y, z)$ then $\vec{v}$ is called a vector fn. of position or vector point fn. and we say that vector field $\vec{v}$ has been defined ~~R~~ in R.

Example :- If the velocity at any point (x, y, z)

within a moving field is known at a certain time, then a vector field is defined.

__Divergence__ :- Let $\vec{v}(x, y, z) = \vec{v_x} i + \vec{v_y} j + \vec{v_z} K$ be defined and differentiable at each point (x, y, z) in a certain region of space, then the divergence of v is written $\nabla \cdot \vec{v}$ or div $\vec{v}$ and is defined by

$$\nabla \cdot v = \left(\frac{\partial}{\partial x}\vec{i} + \frac{\partial}{\partial y}\vec{j} + \frac{\partial}{\partial z}\vec{K}\right) \cdot \left(v_x\vec{i} + v_y\vec{j} + v_z\vec{K}\right)$$

$$= \left(\frac{\partial v_x}{\partial x} + \frac{\partial v_y}{\partial y} + \frac{\partial v_z}{\partial z} \right.$$

Continues.....