

Introduction to Electrodynamics
Problems for practice

In example nos. 2, 3, and 4, “C” is some proportionality constant.

- 1) Find gradient of r , where $r = |\vec{r}|$ and $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$. Can you interpret the result?
 - 2) Electric field in a region is given by $\vec{E} = \frac{C\vec{r}}{\epsilon_0 a^3}$, where “ ϵ_0 ” is permittivity of free space, “ a ” is some constant and \vec{r} is as defined above. Determine the charge density.
 - 3) An electric field is given by $\vec{E} = C(xy\hat{i} + 2yz\hat{j} + 3xz\hat{k})$. Can it be an electrostatic field?
 - 4) A vector field is expressed as $\vec{v} = C(-3x\hat{i} + 3y\hat{j} - 3z\hat{k})$. Can it represent a magnetic field?
 - 5) The electrostatic potential due to a certain charge distribution is given by:
$$V(x, y, z) = -\frac{V_0}{a^4}(x^2yz + xy^2z + xyz^2) \text{ volt,}$$
 where “ V_0 ” and “ a ” are constants with dimensions of volt and metre respectively. Find electric field at a point A ($a, a, 0$) in SI units.
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