1 Diferencialni operatorji

Obravnavamo polje potenciala $\varphi = \left|\overrightarrow{A} \times \overrightarrow{r}\right|$, kjer je $\overrightarrow{A}$ konstanten vektor.

$$E(r) = -\nabla\varphi = A\left(\frac{x}{\sqrt{x^2+y^2}}, \frac{y}{\sqrt{x^2+y^2}}, 0\right)$$

Brez koordinat:

$$\varphi = \sqrt{A^2r^2 - (\overrightarrow{A} \cdot \overrightarrow{r})^2}$$

$$E(r) = -\nabla\varphi(r) = -\frac{\nabla(A^2r^2 - (\overrightarrow{A} \cdot \overrightarrow{r})^2)}{2\sqrt{A^2r^2 - (\overrightarrow{A} \cdot \overrightarrow{r})^2}}$$

$$\nabla r^2 = 2r\nabla r$$

V cilindričnih koordinatah je $\nabla r = \hat{e}_r$.

$$\nabla(\overrightarrow{A} \cdot \overrightarrow{r})^2 = 2(\overrightarrow{A} \cdot \overrightarrow{r})\nabla(\overrightarrow{A} \cdot \overrightarrow{r}) = 2(\overrightarrow{A} \cdot \overrightarrow{r})\overrightarrow{A}$$

Definiramo vektor $\overrightarrow{\rho} = \overrightarrow{r} - \mathrm{pr}^{\perp}_{\overrightarrow{A}}(\overrightarrow{r})$, kar nam da $E(r) = -\frac{\overrightarrow{\rho}}{\rho}$.