

PHYS 703 - Potentials of a moving charge.

1. [Griffiths 10.23] A point charge q moving with constant velocity \vec{v} is at the origin at time $t = 0$. The potentials caused by this charge are known to be

$$\Phi(\vec{r}, t) = \frac{1}{4\pi\epsilon_0} \frac{qc}{\sqrt{(c^2t - \vec{r} \cdot \vec{v})^2 + (c^2 - v^2)(r^2 - c^2t^2)}}$$

and

$$\vec{A}(\vec{r}, t) = \frac{\mu_0}{4\pi} \frac{qc\vec{v}}{\sqrt{(c^2t - \vec{r} \cdot \vec{v})^2 + (c^2 - v^2)(r^2 - c^2t^2)}}$$

Verify that these potentials satisfy the Lorenz gauge condition.