P3323 Rotating Ring
October 14, 2016

A ring with charge Q and radius R is rotating about its axis with period T.

1. Create an integral expression for the magnetic field caused by this ring everywhere in space. We know that

$$\mathbf{B}(\mathbf{r}) = \frac{\mu_0}{4\pi} I \int \frac{d\mathbf{l}' \times \hat{\boldsymbol{\imath}}}{\imath^2}$$

2. Create an integral expression for the magnetic vector potential caused by the ring everywhere in space.

$$\mathbf{A}(\mathbf{r}) = \frac{\mu_0}{4\pi} I \int \frac{d\mathbf{l}'}{\mathscr{r}}$$

3. Develop a power series expansion for the vector potential near the center.

4. Develop a power series expansion for the vector potential for $r \gg R$.