The Magnetic Vector Potential Due to a Spinning Ring of Charge

1. Use the superposition principle for the magnetic vector potential due to a continuous current distribution:

$$\vec{A}(\vec{r}) = \frac{\mu_0}{4\pi} \int \frac{\vec{J}'(\vec{r}')}{|\vec{r} - \vec{r}'|} \, d\tau', \tag{1}$$

   to find the magnetic vector potential everywhere in space due to a spinning charged ring with radius R, total charge Q, and period T.

2. Evaluate your expression for the special case that $\vec{r}$ is on the z-axis.

3. Evaluate your expression for the special case that $\vec{r}$ is on the x-axis.

4. Find a series expansion for the electrostatic potential at these special locations:

   a) Near the center of the ring, in the plane of the ring;

   b) Near the center of the ring, on the axis of the ring;

   c) Far from the ring on the axis of symmetry;

   d) Far from the ring, in the plane of the ring.