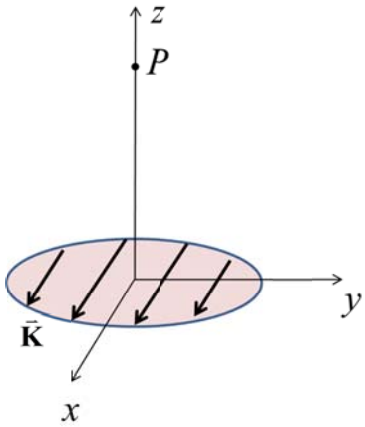
**Lesson #33: Magnetic Vector Potential** **Name:** _____

*Study section 5.4, then answer the following questions.*

Consider the disk of current shown below. The current is flowing in the *x* direction and is uniformly distributed, so that the surface current density is given by $\vec{\mathbf{K}} = K_0 \hat{x}$ where $K_0$ is a constant. In this problem you will find the magnetic vector potential, and then the magnetic field, at a point *P* along the *z* axis. Recall that for surface currents, the vector potential is given by

$$\vec{\mathbf{A}}(\vec{r}) = \frac{\mu_0}{4\pi} \int \frac{\vec{\mathbf{K}}(\vec{r}')}{\mathscr{r}} da' .$$




(a) What is the direction of the vector potential at point *P*?

(b) Sketch an arbitrary area element da' and the corresponding separation vector on the figure.

(c) Now set up and evaluate the integral for the vector potential. Do the integration by hand—this is very easily done if you use cylindrical coordinates!

(d) Now find the magnetic field (magnitude and direction) for points along the *z* axis.