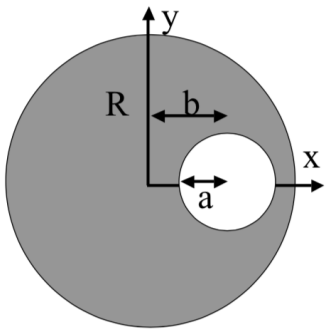
Homework 10

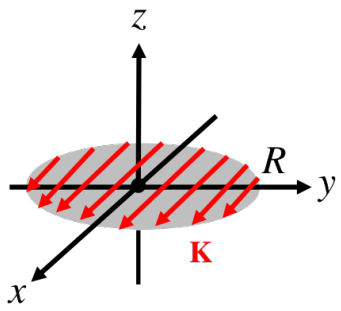
Due Date: All homework submitted by Sunday **11/15** 11:59pm will be graded together. Homework submitted past that time may be graded late. Submit your homework through Canvas as a single pdf file. Do not use solution sets from previous years. You are encouraged to discuss homework assignments with each other, the TAs or myself, but the solutions have to be executed and submitted individually.

Problem A [50%] A long (infinite) wire (cylindrical conductor, radius R, whose axis coincides with the z axis) carries a uniformly distributed current I_0 in the $+z$ direction. A long (infinite) cylindrical hole is drilled out of the conductor, parallel to the z axis. The center of the hole is at $x = b$, and the radius is a with $a < b$.



(1) Determine the magnetic field in the hole.

Problem B [50%] Consider a sheet of current $\mathbf{K} = K_0\hat{\mathbf{x}}$ flowing on the surface of a finite circular disk of radius R lying in the xy plane.



(1) Calculate the vector potential $\mathbf{A}(\mathbf{r})$ along the $\hat{\mathbf{z}}$-axis *above* and *below* the sheet. Plot the z dependence of the non-zero component of the vector potential.

(2) Using the above result, calculate the magnetic field $\mathbf{B}(\mathbf{r})$ at an arbitrary point $\mathbf{r} = (0, 0, z)$ along the $\hat{\mathbf{z}}$-axis *above* and