

Homework 10: Magnetostatics, Biot-Savart, and Ampère's Law

Due Friday, November 11

Problem 1: Semicircle carrying a steady current

A steady current I flows through a semi-circular segment of wire sitting in the x - y plane. The semi-circle is described by

$$x^2 + y^2 = R^2 \quad \text{with} \quad x \geq 0$$

Find the magnetic field at a point on the z axis due to this current. (If you work in cylindrical coordinates remember to pay close attention to integrals containing unit vectors like \hat{s} or $\hat{\phi}$. To avoid confusion you may want to express things in terms of Cartesian unit vectors.)

Problem 2: Magnetic field for two current configurations

Use the Biot-Savart law and/or the results of previous problems to find the magnetic field at the point P for the two steady current configurations shown below.

