Problem 28.12. Two parallel wires are 5.00 cm apart and carry currents in opposite directions, as shown in Fig. 28.37. Find the magnitude and direction of the magnetic field at point P due to the two 1.50 mm segments of wire that are opposite each other and 8.00 cm from point P.

Problem 28.18. Two long, straight wires, one above the other, are separated by a distance 2a and are parallel to the x-axis. Let the +y-axis be in the plane of the wires in the direction from the lower wire to the upper wire. Each wire carries current I in the +x-direction. What are the magnitude and direction of the net magnetic field of the two wires at a point in the plane of the wires (a) midway between them; (b) at a distance a above the upper wire; (c) at a distance a below the lower wire?

Problem 28.23. Four long, parallel power lines each carry 100 A currents. A cross-sectional diagram of these lines is a square, 20.0 cm on each side. For each of the three cases shown in Fig. 28.41, calculate the magnetic field at the center of the square.

Problem 28.30. Calculate the magnitude and direction of the magnetic field at point P due to the current in the semicircular section of wire shown in Fig. 28.46. (Hint: Does the current in the long, straight section of the wire produce any field at P?)

Problem 28.60. Figure 28.54 shows an end view of two long, parallel wires perpendicular to the xy-plane, each carrying a current I but in opposite directions. (a) Copy the diagram, and draw vectors to show the B field of each wire and the net B field at a point P. (b) Derive the expression for the magnitude of B at any point on the x-axis in terms of the x-coordinate of the point. What is the direction of B? (c) Graph the magnitude of B at points on the x-axis. (d) At what value of x is the magnitude of B a maximum? (e) What is the magnitude of B when x ≫ a?
Problem 28.62. A pair of long, rigid metal rods, each of length $L$, lie parallel to each other on a perfectly smooth table. Their ends are connected by identical, very light conducting springs of force constant $k$ (Fig. 28.55) and negligible unstretched length. If a current $I$ runs through this circuit, the springs will stretch. At what separation will the rods remain at rest? Assume that $k$ is large enough so that the separation of the rods will be much less than $L$. 

![Diagram of the rods and springs with $L$ and $d$ labels]