

## SCS 139 Dr.Prapun: Problem Set 2

**Due date: Feb 15, 2013 (Friday)**

1. [HRW, 9E, Q29.12] In Figure 1, two long straight wires at separation  $d = 16.0$  cm carry currents  $i_1 = 3.61$  mA and  $i_2 = 3.00i_1$  out of the page. (a) Where on the  $x$  axis is the net magnetic field equal to zero? (b) If the two currents are doubled, is the zero-field point shifted toward wire 1, shifted toward wire 2, or unchanged?

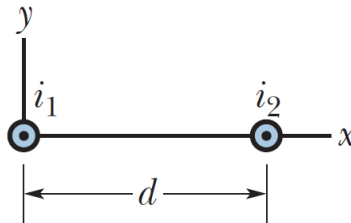


Figure 1: [HRW, 9E, Fig. 29-42]

2. [HRW, 9E, P29.15] Figure 2 shows two current segments. The lower segment carries a current of  $i_1 = 0.40$  A and includes a semicircular arc with radius 5.0 cm, angle  $180^\circ$ , and center point  $P$ . The upper segment carries current  $i_2 = 2i_1$  and includes a circular arc with radius 4.0 cm, angle  $120^\circ$ , and the same center point  $P$ . What are the (a) magnitude and (b) direction of the net magnetic field  $\vec{B}$  at  $P$  for the indicated current directions? What are the (c) magnitude and (d) direction of if  $i_1$  is reversed?

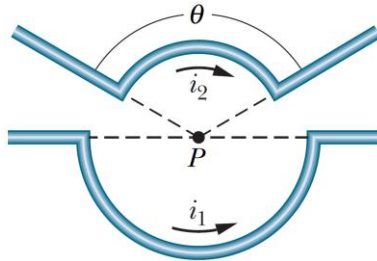


Figure 2: [HRW, 9E, Fig. 29-44]

3. [HRW, 9E, P29.36] In Figure 3, five long parallel wires in an  $xy$  plane are separated by distance  $d = 8.00$  cm, have lengths of  $10.0$  m, and carry identical currents of  $3.00$  A out of the page. Each wire experiences a magnetic force due to the other wires. In unit-vector notation, what is the net magnetic force on (a) wire 1, (b) wire 2, (c) wire 3, (d) wire 4, and (e) wire 5?

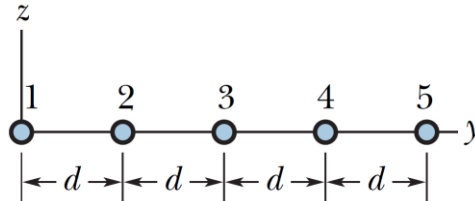


Figure 3: [HRW, 9E, Fig. 29-63]

4. [HRW, 9E, P29.46] Eight wires cut the page perpendicularly at the points shown in Figure 4. A wire labeled with the integer  $k$  ( $k = 1, 2, \dots, 8$ ) carries the current  $ki$ , where  $i = 4.50$  mA. For those wires with odd  $k$ , the current is out of the page; for those with even  $k$ , it is into the page. Evaluate  $\oint \vec{B} \cdot d\vec{s}$  along the closed path in the direction shown.

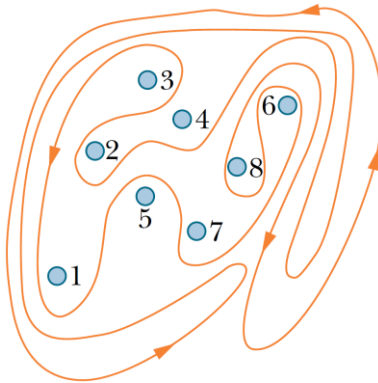


Figure 4: [HRW, 9E, Fig. 29-69]