

SCS 139 Dr.Prapun: Problem Set 2

Due date: Feb 15, 2013 (Friday)

- [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?

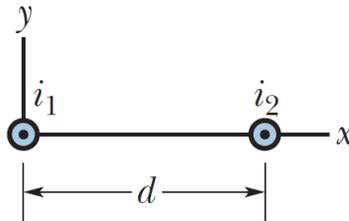


Figure 1: [HRW, 9E, Fig. 29-42]

- [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° , 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° , 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?

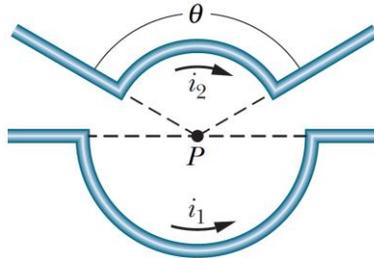


Figure 2: [HRW, 9E, Fig. 29-44]

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?

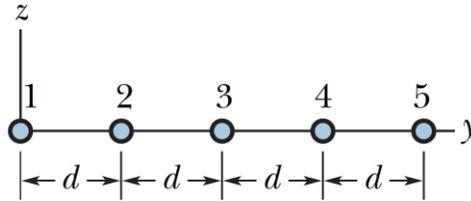


Figure 3: [HRW, 9E, Fig. 29-63]

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.

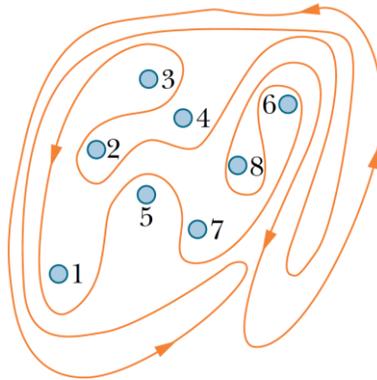


Figure 4: [HRW, 9E, Fig. 29-69]