

68. We refer to the center of the circle (where we are evaluating \vec{B}) as C . Recalling the *straight sections* discussion in Sample Problem 30-1, we see that the current in the straight segments which are colinear with C do not contribute to the field there. Eq. 30-11 (with $\phi = \pi/2$ rad) and the right-hand rule indicates that the currents in the two arcs contribute

$$\frac{\mu_0 i(\pi/2)}{4\pi R} - \frac{\mu_0 i(\pi/2)}{4\pi R} = 0$$

to the field at C . Thus, the non-zero contributions come from those straight-segments which are not colinear with C . There are two of these “semi-infinite” segments, one a vertical distance R above C and the other a horizontal distance R to the left of C . Both contribute fields pointing out of the page (see Fig. 30-6(c)). Since the magnitudes of the two contributions (governed by Eq. 30-9) add, then the result is

$$B = 2 \left(\frac{\mu_0 i}{4\pi R} \right) = \frac{\mu_0 i}{2\pi R}$$

exactly what one would expect from a single infinite straight wire (see Eq. 30-6). For such a wire to produce such a field (out of the page) with a leftward current requires that the point of evaluating the field be below the wire (again, see Fig. 30-6(c)).