5. (a) Recalling the *straight sections* discussion in Sample Problem 29-1, we see that the current in the straight segments collinear with $P$ do not contribute to the field at that point. Using Eq. 29-9 (with $\phi = \theta$) and the right-hand rule, we find that the current in the semicircular arc of radius $b$ contributes $\mu_0 i \theta / 4 \pi b$ (out of the page) to the field at $P$. Also, the current in the large radius arc contributes $\mu_0 i \theta / 4 \pi a$ (into the page) to the field there. Thus, the net field at $P$ is

$$B = \frac{\mu_0 i \theta}{4} \left( \frac{1}{b} - \frac{1}{a} \right) = \frac{(4 \pi \times 10^{-7} \, \text{T} \cdot \text{m/A})(0.411 \, \text{A})(74^\circ \cdot \pi/180^\circ)}{4 \pi} \left( \frac{1}{0.107 \, \text{m}} - \frac{1}{0.135 \, \text{m}} \right)$$

$$= 1.02 \times 10^{-7} \, \text{T}.$$ 

(b) The direction is out of the page.