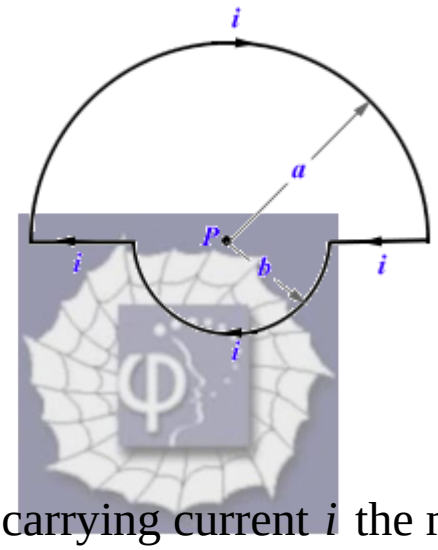
467.

Problem 35.25 (RHK)

For the closed circuit with radii a and b, as shown in the figure, we have to calculate the magnetic dipole moment.



Solution:

For a planar loop carrying current i the magnetic dipole moment is current times the area enclosed by the loop. The circuit given is as shown in the figure. The area enclosed by the loop is

$$A = \frac{1}{2}\left(\pi a^2 + \pi b^2\right).$$

Let $\hat{k}$ be the unit vector coming out of the plane of the page. The magnetic dipole moment of the closed circuit shown in the figure will be

$$\underset{\mu}{\mathrm{r}} = -\frac{\pi i\left(a^2 + b^2\right)}{2}\hat{k}.$$