Homework 9

Physics 112A

Problem 5.37 A circular loop of wire, with radius R, lies in the xy plane (centered at the origin) and carries a current I running counterclockwise as viewed from the positive z-axis.

(a) What is its magnetic dipole moment ?

$$\begin{aligned} m &= I \int da' \\ &= \boxed{I\pi R^2 \hat{z}} \end{aligned}$$

(b) What is the (approximate) magnetic field at point far from the origin ?

$$A = \frac{\mu_0}{4\pi} \frac{m \times \hat{r}}{r^2}$$

(c) Show that, for points on the z-axis, your answer is consistent with the exact field (Ex. 5.6), when $z >> R$.