

Physics 301/571: Electromagnetic Theory I

Read: Griffiths chapters 5.4-6.1

“G” refers to Griffiths’ book.

Problems with stars are not for credit and will NOT be graded.

Homework 9

Exercise 1 (G 5.36 modified)

Find the magnetic dipole moment of the spherical shell of radius R , carrying a uniform surface charge σ and spinning at angular velocity $\vec{\omega}$.

Exercise 2

Find the magnetic field produced by current loop $ABCDEF A$, carrying the current I at distances $r \gg a$. The segments of the loop are straight lines. The coordinates are given by $A = (0, 0, 0)$, $B = (a, 0, 0)$, $C = (a, a, 0)$, $D = (0, a, 0)$, $E = (0, a, 2a)$, and $F = (0, 0, 2a)$.

*Exercise 3

Find the magnetic field produced by current loop C , carrying the current I at distances $r \gg a$. Current loop is given parametrically as $x = a \cos \phi$, $y = a \sin \phi$, $z = 2a \sin 3\phi$, where ϕ is a parameter running from 0 to 2π .

Exercise 4 (G 6.1)

Calculate the torque exerted on the square loop shown in Fig.1, due to the circular loop (assume r is much larger than a or b). If the square loop is free to rotate, what will its equilibrium orientation be?

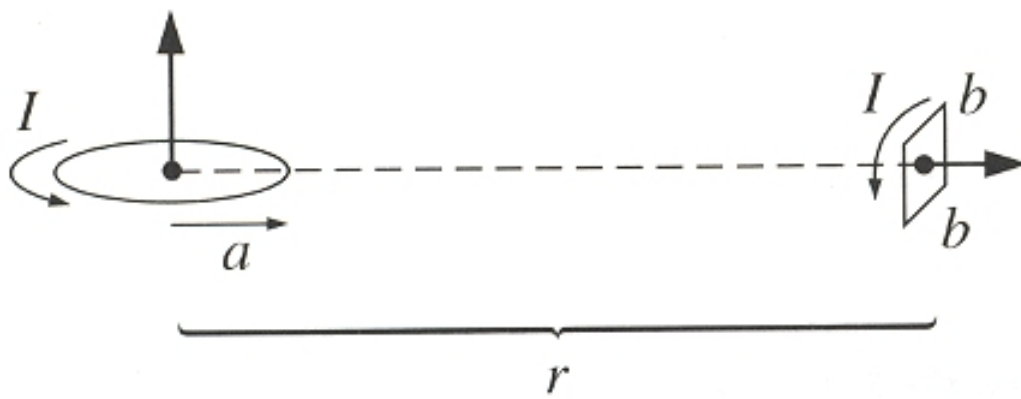


Figure 1: To the exercise 4.