PHYS UN1602 Recitation Week 7 Worksheet

TA: Nitya Nigam

March 12-13, 2025

Problem 1

a) Find the magnetic field a distance z above the center of a circular loop of radius R, which carries a steady current I, as shown in Figure 1.

b) Find the magnetic field at point P on the axis of a tightly wound solenoid (helical coil) consisting of n turns per unit length wrapped around a cylindrical tube of radius a and carrying current I, as shown in Figure 2. Express your answer in terms of θ_1 and θ_2. Consider the turns to be essentially circular, and use the result of part a). What is the field on the axis of an infinite solenoid (infinite in both directions)?

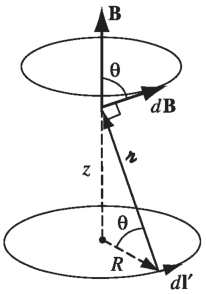

Figure 1

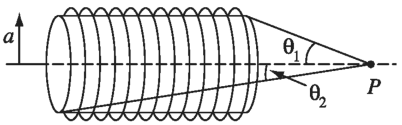

Figure 2

Problem 2

A current I runs along an arbitrarily shaped wire that connects two given points, as shown in Figure 3 (it need not lie in a plane). Show that the magnetic field at distant locations is essentially the same as the field due to a straight wire with current I running between the two points.

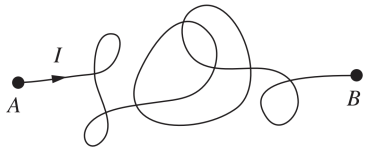

Figure 3