

**HOMEWORK SET 9: TORQUE ON A CURRENT LOOP**  
 Due Monday, February 19, 2024

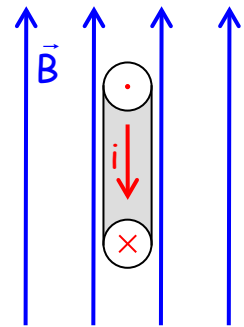
PROBLEMS FROM TZDII<sup>1</sup>

9.8) The point of this problem is to determine if a model of the electron as a spinning ball of charge is reasonable, given our estimates of its size. You should conclude something about the appropriateness of that model from the value you get for the equatorial speed.

9.9) The current loop in the magnetic field is shown with the current flowing down in the front of the loop, draw this in your solution for both parallel and perpendicular, showing  $\vec{A}$ ,  $\vec{F}$ , and  $\vec{\tau}$  in each case.

9.11)

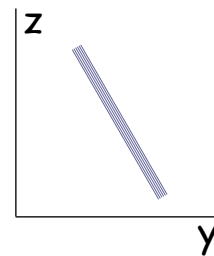
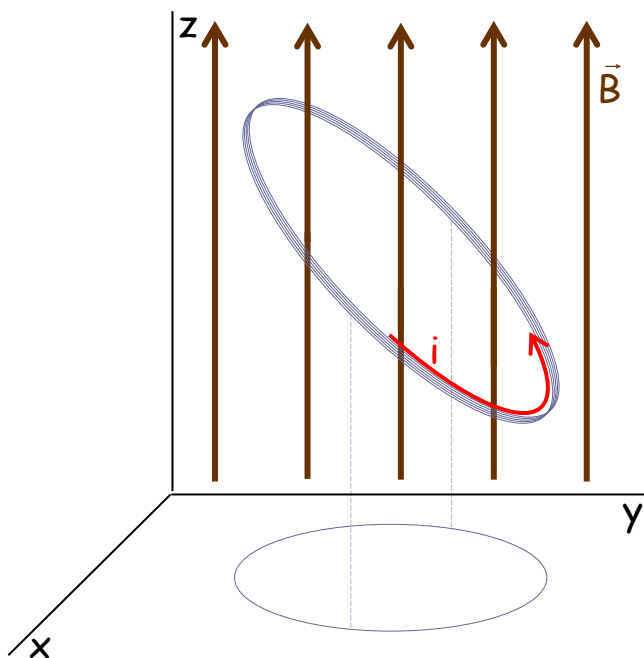
9.14)



PROBLEM FROM AOD

5) A small circular coil consisting of 20 turns of wire lies in a region with a uniform magnetic field of  $B = 0.50 \text{ T}$  in the z-direction. The normal to the plane of the coil makes an angle of  $60^\circ$  with the direction of the magnetic field. The radius of the coil is 40 cm, and the wire carries a 3.0 A current. In the diagram, the lower portion of the coil is

- a) Draw the area vector on the diagram<sup>2</sup> (the lower portion of the loop is in front).
- b) What is the magnitude and direction of the magnetic moment of the coil?
- c) What is the magnitude of the torque exerted on the coil?
- d) Draw the torque vector on the diagram.



"Got any 25-amp fuses?"

<sup>1</sup> Taylor, Zafiratos, & Dubson, *Modern Physics for Scientists and Engineers*, 2<sup>nd</sup> Edition, Pearson, Prentice Hall, 2004

<sup>2</sup> Hand in this sheet with your homework