

Physics 704/804
Problem Set 2
Due Feb 12, 2009

- 1) Please verify the equivalence in detail in the Generalized Faraday Law for the EMF in the case of a circular loop of radius a , by explicitly computing the various integrals involved. Assume the loop rotates clockwise (as viewed from above) about the z-axis, the uniform magnetic induction form is $B_x dy \wedge dz$, the center of the loop is at the center of the Cartesian coordinate system, and at $t = 0$ the loop is in the x-z plane.
 - a) Write out a parameterization of the position of the loop elements as a function of time. Example: Use φ , the angle between the loop element and the x-y plane, as the parameter for the individual elements of the loop and determine $\vec{x}(\varphi, t)$ for all the loop elements.
 - b) Evaluate the time-dependent line integral on the LHS of the Generalized Faraday Law.
 - c) Evaluate the Magnetic Flux through the loop as a function of time. Compare its time derivative to the answer in part b.
- 2) Jackson, Problem 6.2
- 3) Jackson, Problem 6.3