Physics 200

Chapter 31: Faraday's law (Lecture Examples)

Ex:1   Find the voltage induced in a circular loop inside a solenoid if the solenoid
        current goes from 0 to a maximum in time, t.

Ex:2   How long does it take a magnetic field to increase from strength, B, to 5B if an
        emf, V, is induced in a loop with radius, a, which is penetrated by the field?
        (assume the field is perpendicular to the plane of the loop)

Ex:3   A circular loop's radius is changing at rate, K, when the radius is "a". What is
        the induced voltage if the loop is in a magnetic field, B?

Ex:4   Four resistors, R, are connected to form a square loop that is a length, L, on a
        side. At what rate is energy being dissipated in the resistors at time, t, if $B(t) = B_0$
        exp(- t/3)?

Ex:5   A horizontal rod with length, L, is falling with a speed, v, in a horizontal
        magnetic field, B. Find the potential difference between the ends of the rod.

Ex:6   A rod length, L, moves with speed, v, along two rails in a direction that is
        perpendicular to a uniform magnetic field, B. A resistor, R, connects the two rails
        and completes the circuit. Find the current in the resistor.

Ex:7   A loop of wire is being pulled through a uniform confined B field. Does the rate
        at which work is done by the pulling the force equal the rate that energy is being
        dissipated by the loop's resistance?

Ex:8   Calculate the E field in a ring of radius, r, caused by changing B field.
        $B = B_O \sin(\omega t)$

Ex:9   Calculate the maximum generator voltage for a coil of wire rotating with angular
        frequency, ω, in a constant magnetic field, B. There are "N" loops with area, A.