4/7/2005. **Due:** Thursday, April 15, 2005 (in class).

Physics 302/572: Electromagnetic Theory II

Read: Griffiths 11.1

"**G**, **PS**" refer to Griffiths and Pollack & Stump books respectively.
Problems with stars are not for credit and will NOT be graded.

Homework 8

Exercise 1 (G 11.3)

Find the **radiation resistance** of the wire joining the two ends of the dipole. (This is the resistance that would give the same average power loss – to heat – as the oscillating dipole in *fact* puts out in the form of radiation.) Show that $R = 790(d/\lambda)^2\,\Omega$, where λ is the wavelength of the radiation. For the wires in an ordinary radio (say, $d = 5cm$), should you worry about the radiative contribution to the total resistance?

Exercise 2 (G 11.9)

An insulating circular ring (radius b) lies in the xy plane, centered at the origin. It carries a linear charge density $\lambda = \lambda_0 \sin\phi$, where λ_0 is constant and ϕ is the usual azimuthal angle. The ring is now set spinning at a constant angular velocity ω about the z axis. Calculate the power radiated.

Exercise 3 (G 11.10)

An electron is released from rest and falls under the influence of gravity. In the first centimeter, what fraction of the potential energy lost is radiated away?

Exercise 4 (G 11.22 modified)

A radio tower of the height 200 m is located in the city with radio-emission limit of 200 microwatts/cm^2. The total power output is 35 kilowatts, the frequency of radio waves is 90 MHz, and the antenna's radius is 6 cm. (FM station, magnetic dipole antenna). Is the station in compliance with city's radio-emission limits?