HOMEWORK SET #4

Note: Please show all the steps leading to the final answer.

1. Show that by letting $l = \lambda/2$, equation (1) on page 26 of chap4 slide reduces to equation (2) on page 32.

2. Derive equation (3) on page 38 of chap4 slide.

3. A horizontal infinitesimal electric dipole of constant current I_0 is placed symmetrically about the origin and directed along the x axis. Derive
   (a) far-zone fields (**E** and **H**) radiated by the dipole
   (b) maximum directivity of the antenna

4. Repeat the previous problem for an infinitesimal magnetic dipole of constant magnetic current M_0.

5. A half-wavelength dipole is radiating into free-space. The coordinate system is defined so that the origin is at the center of the dipole and the z-axis is aligned with the dipole. Input power to the dipole is 100 W. Assuming an overall efficiency of 50%, find the power density (in W/m^2) at $r =$ 500 m, $\theta = 60°$ and $\phi = 0°$.