

ECEn 665
Antennas and Propagation for Wireless Communication

Homework #3

Due Jan. 23, 2023 at the beginning of class (may be turned in late for half credit)

1. (a) Derive formulas for the directivity and radiation resistance of a Hertzian dipole. (b) Evaluate the directivity and radiation resistance using the Hertzian dipole model with the antenna length equal to a half wavelength. How accurate is this value?
2. Prob. 2.4 [gain and beamwidth]
3. The far-field time-average Poynting vector radiated by an antenna is $S_r = \sin \theta \sin \phi / r^2 \text{ W/m}^2$ for $0 \leq \theta \leq \pi$, $0 \leq \phi \leq \pi$ and is zero elsewhere. Find (a) the directivity and (b) the azimuthal and elevation plane half-power full beamwidths in degrees.
4. If the ohmic loss in a dipole antenna is 1Ω , estimate the radiation efficiency.