HW#8

10-2. The radiation intensity of an antenna is given as

$$U(\theta,\phi)=\begin{cases}50sin^2\theta cos\phi; & 0\le\theta\le\pi,-\pi/2\le\phi\le\pi/2\\ 0; & elsewhere\end{cases}$$

Find (a) the directivity, and (b) the radiation resistance of the antenna if the magnitude of the input current is 2(A) and losses are negligible.

10-5. Determine the radiation efficiency of a center-fed dipole of length 1.5 (m) operating at 100 (MHz). The dipole is made of brass and has a radius of 1 (mm).

10-9. The angle between the half-power points of the main beam of the radiation pattern of an antenna is often called the beamwidth of the pattern. Find the beamwidth of the E-plane pattern of (a) a Hertzian dipole, and (b) a half-wave dipole.

10-13. For a five-element broadside binomial array:

a) Determine the relative excitation amplitudes in the array elements.
b) Plot the array factor for d=λ/2.

10-15. Obtain the pattern function of a uniformly excited rectangular array of $N_1 \times N_2$ parallel half-wave dipoles. Assume that the dipoles are parallel to the z-axis and their centers are spaced d_1 and d_2 apart in the x- and y- directions, respectively.

10-20. The antenna of a 120-(kW) monostatic radar operating at 3 (GHz) has a directive gain of 20 (dB). Suppose that it tracks a target 8 (km) away and that the backscatter cross section of the target is 15 (m^2). Determine

a) The magnitude of the electric intensity at the target,
b) The amount of power intercepted by the target, and
c) The amount of the reflected power absorbed by the antenna at the radar.