Engineering 7811 Assignment 3 Part 2 **Due: Wed. March 9, 2016**

1. Determine and sketch the current pattern on a 50 cm dipole antenna in free space that is receiving a 900 MHz cordless phone signal (assume reciprocity holds). Determine and plot the expression for the principal E-plane pattern of this antenna. You may use Matlab (supply the code) or some other convenient graphing package for your labelled plots.

2. A 100 MHz signal is being transmitted using a 1.5 m monopole over a ground plane. (a) Determine the radiation resistance of the monopole assuming free space above the ground plane. Make any necessary simplifications for the case at hand before using the required equation. You'll need to use appropriate software or interpolations from look-up tables to evaluate any necessary Sine and Cosine integrals. Be sure to reference what you use. (b) If the element carries a current of 500 mA, determine the radiated power. (c) Write down the far-field $\vec{E}$ expression and determine the maximum value and direction of the power density at a distance of 5.0 km from the antenna. (d) Given that the effective area of the receiving antenna (we'll talk more about this later) which intercepts the power density in (c) is 0.02 m^2, determine the *power* delivered to this receiving antenna's terminals if the efficiency is 50%. You may assume that the power density is constant over the antenna aperture for this purpose.

3. A particular antenna has a uniform field pattern for elevation angles between 30° and 60° and for azimuthal angles between 90° and 210°. If $|\vec{E}| = 4.0$ V/m at a distance of 500 m from the antenna and the terminal current is 500 mA, find the radiation resistance. The E-field does not exist outside the given angles.