Assignment -II on the Course "Electrodynamics II (Phys 3082)" for third year students

- 1. Consider an infinite parallel-plate capacitor, with the lower plate (at z = -d/2) carrying the charge density $-\sigma$, and the upper plate (at z = +d/2) carrying the charge density $+\sigma$.
 - a. Determine all nine elements of the stress tensor, in the region between the plates
 - b. Determine the force per unit area on the top plate.
- A piece of wire bent into a loop as shown figure below, carries a current that increases linearly with time : I(t)=kt



Figure 1

Calculate the retarded vector potential \mathbf{A} at center. Find the electric field at center. Why does this wire produce an electric field? Or why can't you determine the magnetic field from this expression for \mathbf{A}

3. Determine the Lienard-Wiechert potentials for a change in hyperbolic motion for the following equation . Assume the point r is on the x axis and to the right of the charge

$$w(t) = \sqrt{b^2 + (ct)^2} \tilde{x} \qquad (-\infty, \infty)$$

- 4. As a model for electric quadupole radiation, consider two oppositely oriented oscillating electric dipoles, separated by a distance d as shown in fig. 2.
 - a) Find the scalar and vector potentials
 - b) Find the electric and magnetic fields
 - c) Find the pointing vector and power radiated. Sketch the intensity profile as a function of θ



Figure 2