PHYS 622 – Homework # 1 – DUE MONDAY, 02/01/2010

Problem 1. Show that in the Coulomb Gauge $\nabla \cdot \mathbf{A} = 0$ the Maxwell equations can be put in the form

$$\phi = \frac{1}{4\pi\epsilon_0} \int d^3x' \, \frac{\rho(\mathbf{x}', t')}{|\mathbf{x} - \mathbf{x}'|} \, ,$$

$$\nabla^2 \mathbf{A} - \frac{1}{c^2} \frac{\partial^2 \mathbf{A}}{\partial t^2} = -\mu_0 \mathbf{J}_t \, ,$$

where $\mathbf{J}_t$ is the transverse current

$$\mathbf{J}_t = \frac{1}{4\pi} \nabla \times \nabla \times \int d^3x' \, \frac{\mathbf{J}(\mathbf{x}', t)}{|\mathbf{x} - \mathbf{x}'|} \, .$$

Problem 2. Jackson problem 11.1.

Problem 3. Jackson problem 11.3.