Name: _____

ID#: _____

Midterm Exam

(due by 11:00 am on February 25, 2014)

Problem 1. [10] Referring to the Kirchhoff formula, explain the physical difference between the 2D and 3D cases of wave phenomena; namely, consider a disturbance propagating from a point source and comment on what happens behind the wave front $|x| = at$, i.e. for later times, $t > |x|/a$.

Problem 2. [20] Find the volume ("domain") potential of a spherical layer, $a \le r \le b$ with a constant charge density ρ_0.

Problem 3. [20] Solve the boundary/initial value problem on a half-line:

$$\begin{aligned} \frac{\partial u}{\partial t} &= \frac{\partial^2 u}{\partial x^2},\ x \in \mathbb{R}^+,\ t > 0, \\ u(x,0) &= f(x);\ x \in \mathbb{R}^+, \\ u_x(0,t) &= 0,\ t > 0. \end{aligned}$$