Massachusetts Institute of Technology
Department of Physics
Physics 8.022 - Fall 2002

Assignment #3
Div, Curl, Laplace's and Poisson's Equations
Conductors, Capacitance

Reading *Purcell* Chapter 2 and 3.

Problem Set #3
Work on **all** problems. Not all problems receive equal points. Total points for this set is 100.

- **(10 points) [1]** Useful identities:
  If u is a scalar function and **V** is a vector function, show that:
  (a) $\nabla(u\mathbf{V}) = u\nabla\mathbf{V} + (\nabla u)\mathbf{V}$ and (b) $\nabla\times(u\mathbf{V}) = u\nabla\times\mathbf{V} + (\nabla u)\times\mathbf{V}$.

- **(15 points) [2]** *Purcell* Problem 3.3 (p.113): Charges near a conducting plane.
- **(15 points) [3]** *Purcell* Problem 3.4 (p.113): More charges near a conducting plane.
- **(15 points) [4]** *Purcell* Problem 3.5 (p.114): And even more charges near a conducting plane.
- **(15 points) [5]** *Purcell* Problem 3.10 (p.115): Spherical capacitor.
- **(15 points) [6]** *Purcell* Problem 3.16 (p.116): Electric force on a capacitor.
- **(15 points) [7]** *Purcell* Problem 3.17 (p.116): Design of a spherical capacitor.

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