Physics 3201
Problem Set 11, Problem 2 revised on 11/12/13

Due: Thursday, November 14. Solutions will be posted at mid-day on Friday, Nov. 15.

Notes: This problem set covers Section 4.4 of Griffiths, and is shorter than usual because of the exam on Nov. 12. You should start reading the first few sections of Chapter 5.

Exam 2: The second hour exam on Nov. 12 will focus particularly on Chapters 3-4, up to and including Section 4.4.1. You will be permitted to bring a single page of notes, and copies of the front and back covers of Griffiths will also be provided. There will be a *review session* on Monday, Nov. 11, at 5 PM in Room P103A.

1. Two horizontal dielectric slabs with dielectric constants $\varepsilon_{r1} = 2$ and $\varepsilon_{r2} = 4$ are stacked atop one another, with their interface on the *xy* plane. An electric field of 10 V/m is present in the upper (ε_{r1}) slab, oriented at a 45° angle (that is, in the $(\hat{\mathbf{x}} + \hat{\mathbf{z}})$ direction).

(a) If there are no free charges on the interface, find the magnitude and direction of the field in the lower slab.

(b) Repeat the calculation if there is a free charge density $\sigma_f = 8.85 \times 10^{-11}$ C/m^2 on the interface, and the field in the upper slab is still as described above.

2. Griffiths Problem 4.18 (same in 3rd Ed.). I originally assigned Problem 4.19, but discussed the solution in our Nov. 11 review session, thinking that I had assigned another problem. If you've already written up (4.19), that's OK, but otherwise please switch to Problem 4.18 instead. It's a variation on the same ideas.

3. Griffiths Problem 4.31 (new in 4th Ed.). Be sure to consider the question about perpetual motion, which is the interesting and fun part of this problem.

4. (15 points) Griffiths Problem 4.24 (same in 3rd Ed.)

Honors: Problem 4.38. The next meeting of honors students will be on Nov. 22, at 1:30 PM in room P302S.