

PHYS 402: Electricity & Magnetism II  
Due date: Thursday, October 6, 2011

### Problem set #4

Griffiths (3<sup>rd</sup> Ed.) problems  
9.10, 9.13, 9.14, 9.21

#### **Problem: Index Matching**

- a. Suppose you have two medium with  $n_2 > n_1$ , and you want to transmit light from medium 1 to medium 2 with minimal losses, does adding in a third medium between 1 and 2 with  $n_2 > n_3 > n_1$  help reduce transmission losses? Support your claim with a quantitative analysis (do not assume any effects due to interference).
- b. What is the best you can do with this method, i.e. what is the highest transmission you can achieve compared to the original situation? What is the optimal choice for  $n_3$  if the two original media were air and BK7 glass and propose a suitable material?
- c. Can you improve your index matching by adding additional layers of index matching materials?