

PHYS 402: Electricity & Magnetism II  
Due date: Thursday, September 29, 2016

**Problem set #4**

Griffiths 4<sup>th</sup> Ed. [3<sup>rd</sup> Ed.] problems  
9.10 [9.10], 9.14 [9.13], 9.15 [9.14], 9.16 [9.15]

**Problem: Index Matching**

- a. Suppose you have two mediums 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/include 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?