PHYS 402: Electricity & Magnetism II
Due date: October 12, 2017

Problem set #4

Griffiths 4$^{\text{th}}$ Ed. [3$^{\text{rd}}$ 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?