

ELEG240- Spring, 2006  
Homework 4  
Due 3/13, noon

1. A prism made of lithium niobate will separate the colors of light much more than a glass prism. What does this indicate about the difference in the wavelengths where lithium niobate and glass begin absorbing light as you move to shorter wavelengths from the visible to the ultraviolet?
2. Is the refractive index of silicon roughly the same in the radio wave and fiber optic portions of the spectrum? Why?
3. When light reflects off of a perfect conductor, the electric field of the reflected light is exactly equal but opposite in sign to the incident light. It has been suggested that another way to make a laser than stated in the text is to place a perfect conductor on one side. Using the same type of analysis (I start it for you in the figure) as in the text for the laser of figure 4.D.1, determine what  $L$  should be in terms of wavelength  $\lambda$  (as measured in the gain medium) to get lasing. note: Use  $k = k_{real} - ik_{imag}$  to denote gain. Also use  $k_{real} = \frac{2\pi}{\lambda}$ . Hint:

$\frac{1}{1+x^2} = 1 - x^2 + x^4 \dots$ , and the denominator can still be zero! Think complex!

