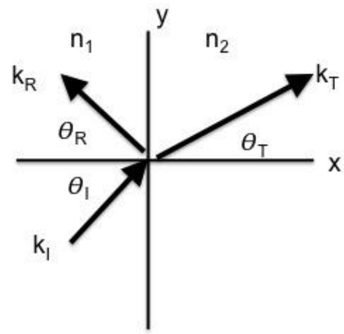
If we'd like to derive Snell's law ($n_1/n_2 = \sin\theta_T / \sin\theta_I$) using the figure shown as below: ***With polarization unspecifiied, which one of these boundary conditions is needed to for the derivation ?***



- $\mathbf{E_1^{/\!/}=E_2^{/\!/}}$
- $\boldsymbol{\epsilon_1 E_1^{\perp}=\epsilon_2 E_2^{\perp}}$
- $\mathbf{B_1^{\perp}=B_2^{\perp}}$
- $\mathbf{B_1^{/\!/}/\mu_1=B_2^{/\!/}/\mu_2}$
- You really can't pick - in general ANY of these can be used!

Following the previous question, at one point in the derivation of Snell's law we get this relationship: $\mathbf{k_I \cdot r = k_T \cdot r}$ Looking again at the figure above, which of the following components of k is directly relevant for deriving Snell's law?

x, y, z, or more than one?

Please use the space below to elaborate your reasoning to the two previous question.

In Griffiths 9.4.1, we discover that in a conductor (satisfying Ohm's law), our wave equation can only be solved if k (the wave vector) is COMPLEX. What are the simplest physical interpretations of the real and imaginary parts of k?

Select ALL that you think are correct

- k(Real) tells you information about the traveling speed of the wave
- k(Real) tells you information about the wavelength of the wave
- k(Real) tells you information about the skin depth to which the wave penetrates
- k(imag) tells you information about the traveling speed of the wave
- k(imag) tells you information about the wavelength of the wave
- k(imag) tells you information about the skin depth to which the wave penetrates

(continued…)

Later in 9.4.1, Griffiths figures out the formulas for k(real) and k(imag) (He calls the latter "kappa")
They are kind of ugly. But, in the limit of a "very good conductor" (like silver, or Aluminum, etc) at some reasonable (not too high) frequency, the story simplifies. Choose the ONE best answer from the list below:

- k(real) and k(imag) both become rather large, and roughly equal to one another
- k(real) and k(imag) both become rather small, and roughly equal to one another
- k(real) and k(imag) both become roughly the "free space" value that you entered with, and roughly equal to one another
- k(real) gets rather large, but k(imag) gets rather small
- k(real) gets rather small, but k(imag) gets rather big
- Something else!

In electrostatics, which mathematical relationship is the reason that we can express E=-grad(V)?

- $\nabla \times (\nabla f)=0$
- $\nabla \cdot (\nabla \times F)=0$
- Both/either one!

Optional: if you want to elaborate on either of the previous two questions, please do so here.