New:

Which relationship is the reason that we can express B=-curl (A)?

$\nabla \times (\nabla f)=0$, or $\nabla \cdot (\nabla \times F)=0$

Which of the following seem like possible "gauge choices"? Choose all you think are possible in general:

div(A)=0 , A=0 , curl(A)=0 , div(A)=-(1/c^2) dV/dt , $-\nabla V-\partial A/\partial t=0$, V=0

Please elaborate your reasoning on the above question.

Gauge transformations, gauge choice, even just the magnetic vector potential "A" itself, are all pretty abstract and unfamiliiar things. Do you have any questions you can articulate, anything that you would like to have explained further or better?

Review:

Try this without peeking at your notes: suppose you have a circuit with inductors and/or capacitors and resistors, and the complex impedance Z has a *negative* phase angle. The circuit is driven by a simple sinusoidal source. Does the current lead or lag the voltage?

Current and Voltage are in phase in this case.
Current leads the voltage in this case
Current lags the voltage in this case
Current ALWAYS leads the voltage in RLC circuits
Current ALWAYS lags the voltage in RLC circuits
You need to know more than just the sign of phase of the complex impedance to decide. (Let us know in the space below)

Take a look at the activity we did in class back on Oct 8, where we had a simple circuit (battery and resistor) and considered the E and B fields just inside and outside the cylindrical resistor: Sjp08 energy flow We drew various "loops" (some enclosing the boundary of the resistor, some small, some large)... Think about why all the various line integrals we considered must be zero, and then answer this: What does this (zero line integrals of E dot dl) tell us about the perpendicular and parallel components of the electric field outside the resistor?

The perpendicular component is non-zero and uniform, the parallel component points opposite to the parallel component in the resistor
The perpendicular component is zero, the parallel component points in the same direction to the parallel component in the resistor
The perpendicular component is non-zero and non-uniform, the parallel component points opposite to the parallel component in the resistor
The perpendicular component is non-zero and non-uniform, the parallel component points in the same direction to the parallel component in the resistor
Both components are zero
Something else entirely!

Consider an infinitely long solenoid, radius R. Suppose that the solenoid current is increasing steadily with time. If you look at a point JUST inside the edge (s just less than R), what can you say about the direction of the Poynting vector?

It points inwards radially
It points outwards radially
It is zero
It points parallel to the edge of the solenoid ("longitudinally")
The answer depends on the DIRECTION of the circulation of current!
Other (please elaborate in the small box)

In the previous question, if you look at a point JUST OUTSIDE the edge (s just greater than R), what can you say about the direction of the Poynting vector?

It points inwards radially
It points outwards radially
It is zero
It points parallel to the edge of the solenoid ("longitudinally")
The answer depends on the DIRECTION of the circulation of current!
Other (please elaborate in the small box)

Optional: feel free to explain your reasoning to any of the previous few questions here

For an electromagnetic plane wave in free space, how do the directions of E, B, k & S compare to each other?

E is parallel to k, B is parallel to S, S is perpendicular to k
S is parallel to k, E is perpendicular to k and B, B is perpendicular to k
E is perpendicular to B, k is perpendicular to S
S is parallel to k and E, B is perpendicular to S
Something else entirely, the directions have more "freedom" than the choices above suggest!

In class and in homework #8, we discussed how to use the complex exponential form of an electric field plane wave to calculate things like the Poynting vector, energy density, and the intensity. This field is written as follows: $\tilde{\vec{E}}(x,y,z,t) = \tilde{\vec{E}}_0 \exp\left[i\left(\vec{k}\bullet\vec{r} - \omega t\right)\right]$

Which of the following expressions do you use in computing the electric part of the energy density?

(1/2)ϵ_0(Re[E(x,y,z,t)])^2
(1/2)ϵ_0Re[(E(x,y,z,t))^2]
(1/2)ϵ_0|E(x,y,z,t)|^2
(1/2)ϵ_0(E(x,y,z,t))^2
None of these is appropriate/MORE than one could work/it's complicated!

How about the Intensity I? Hint: *E0* as given above is a *complex* quantity!

(1/2)cϵ_0 E_0^2
(1/2)cϵ_0 |E_0|^2
(1/2)cϵ_0 (Re[E_0])^2
(1/2)cϵ_0 Re[E_0^2]
None of these, more than one, or something else!

Optional: If you want to elaborate on any of the previous questions, please feel free.

Consider an electromagnetic wave traveling in vacuum with wavelength *λ*, angular frequency *ω*, electric-field amplitude *E0*. This wave is incident on a dielectric material with (real) index of refraction *n*.
Choose ALL the statements that that apply to this scenario:

The transmitted wave has a smaller wavelength than the incident wave
The transmitted wave has a frequency ω_T = ω/n
The amplitude of the transmitted wave is independent of the direction of the polarization of the incident wave.
The amplitude of the transmitted wave is independent of the direction of the k vector of the incident wave
There will always exist a Brewster's angle for the reflected wave, independent of the polarzation of the incident wave
The transmitted wave is always in-phase with the incident wave

For an electromagnetic plane wave in a good conductor, what is the relationship between the phase of E and the phase of B?

They are in phase
E leads B by 45 degrees
E lags B by 45 degrees
E leads B by 90 degrees
E lags B by 90 degrees
They are 180 degrees out of phase
Something else!

Optional: If you want to comment on either of the above 2 questions, feel free.