With your groupmates, discuss and answer the following, and write down your answer.

What is a Green's function, and what does it do?

So, the retarded potentials…

$$V(\vec{x},t) = \frac{1}{\varepsilon_0}\int \frac{\rho(\vec{x}',t')}{4\pi|\vec{x}-\vec{x}'|}d^3x' \qquad \vec{A}(\vec{x},t) = \mu_0\int \frac{\vec{J}(\vec{x}',t')}{4\pi|\vec{x}-\vec{x}'|}d^3x'$$

With $t' = t - \dfrac{|\vec{x}-\vec{x}'|}{c}$

Are they in a particular gauge?

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A. Yes, they're in the Coulomb gauge, meaning $\nabla \cdot \vec{A} = 0$ always 21

B. Yes, they're in the Lorenz gauge, meaning $\nabla \cdot \vec{A} = -\frac{1}{c^2}\frac{\partial V}{\partial t}$ always

C. They weren't derived with any particular gauge in mind, so they *might* satisfy one (or both) of the above, but not necessarily 21

Suppose we have a function f and we take its derivative with respect to regular time vs. taking it with respect to retarded time. How will the two derivatives differ?

$$\frac{\partial f}{\partial t} \qquad \frac{\partial f}{\partial t'}$$

$$\frac{\partial f}{\partial t'}\frac{\partial t'}{\partial t} \longleftrightarrow \frac{\partial f}{\partial t'} \quad ?$$

A. They won't differ
B. They'll be the same up to a constant
C. They'll have some more complicated, but fixed, relationship
D. What kind of relationship they have will depend on something