1. The derivation of the relativistic version of the Lorentz force law, \( K^\mu = q\eta_\mu F^{\mu\nu} \), that I presented in class on Friday depended on being able to write

\[
\frac{\partial E}{\partial t} = \mathbf{F} \cdot \mathbf{u},
\]

where \( E \) is the (relativistic) energy of the particle and \( \mathbf{F} \) and \( \mathbf{u} \) are the force on and ordinary velocity of the particle, respectively. (At least one of you noticed that this relation isn’t as trivial as I made it out to be!) Show that Eq. 1 is true. *Hint*: start by writing \( E = \sqrt{(pc)^2 + (mc^2)^2} \) and then differentiate.

2. Griffiths Problem 12.45
3. Griffiths Problem 12.47
4. Griffiths Problem 12.66
5. Griffiths Problem 12.67