

APM 426 / 1700
Assignment 1

Prof. McCann

Due: Thursday Jan. 19

Practice problem: Schutz # 1.19

To be graded: Schutz # 1.17, 1.18 and

1. a) Show the wave equation to be invariant under Lorentz boosts: i.e., $f(t, x)$ solves

$$\frac{1}{c^2} \frac{\partial^2 f}{\partial t^2} = \frac{\partial^2 f}{\partial x^2}$$

($c = 1$) if and only if the corresponding function

$$\bar{f}(\bar{t}, \bar{x}) := f(\bar{t} \cosh u + \bar{x} \sinh u, \bar{t} \sinh u + \bar{x} \cosh u)$$

satisfies an equation of the same form with respect to the boosted variables.

- b) Show the wave equation is not invariant under the Galilean boost $\bar{t} = t$, $\bar{x} = x - vt$.
c) BONUS: Infer conclusions about Maxwell's equations in vacuo; (e.g. Schutz 4.59).