

**CHAPTER 1: PHYSICS IN FLAT SPACETIME: GEOMETRIC VIEWPOINT****Reading:**

Chapter 1 of Blandford and Thorne: Available at <http://www.pma.caltech.edu/Courses/ph136/2002/>

*Note:* This chapter is much longer than the other chapters of the book. However, it should be fairly easy reading since the material it covers will largely be familiar from previous courses; only the viewpoint will be new.

**Problems**

Note: I give you many options as to which problems to work. Please choose the ones that will teach you the most. Avoid those that are trivial for you, and abandon those that you find so difficult that you get badly hung up. If, in any problem, the choices I give are all trivial or all terribly difficult, then say so and pick some other problem from the chapter.

A. Work one of the following:

1.1 Geometrized units

1.5 Numerics of component manipulations *and* 1.6 Meaning of slot-naming index notation

1.15 Vectorial identities (I especially recommend this one).

B. Work one of the following:

1.7 Frame-independent expressions for energy, momentum and velocity

1.18 3+1 split of charge-current 4-vector

C. Work one of the following:

1.8 Doppler shift without Lorentz transformation. I did this in class; if you fully understood it and now regard it as trivial, then do the analogous problem for a particle with finite rest mass rather than a photon, or do:

1.16 Reconstruction of  $\mathbf{F}$ .

D. If it is not trivial for you, *do* work 1.11 Spacetime diagrams. Otherwise work one of:

1.13 Twins paradox

1.14 Around the World on TWA

E. Work one of

1.21 Global conservation of 4-momentum in a Lorentz frame.

1.22 Stress-energy tensor for a perfect fluid