Physics 250: Introduction to String Theory

# Homework Assignment I

This first homework assignment is very simple, and mostly serves to establish the procedure. Starting with Homework Assignment II you can expect much more demanding tasks. This assignment is worth 5 points, and is due Thursday, February 7 in class.

1. (Problem 1.1 of [Polchinski, Vol. I]):

   (a) Show that in the nonrelativistic limit the action of the point particle (in the form before introducing the auxiliary metric $\gamma$ on the worldline) has the usual nonrelativistic form, kinetic energy minus potential energy, with the potential energy being the rest mass.

   (b) Show that for a string moving nonrelativistically, the Nambu-Goto action reduces to a kinetic term minus a potential term proportional to the length of the string. Show that the kinetic energy comes only from the *transverse* velocity of the string. Calculate the mass per unit length, as determined from the potential term and also from the kinetic term.