The in-class midterm will consist of easy computations, statements of definitions, maybe some drawing, and perhaps an easy proof. The idea is to encourage you to go back and review all the things we've learned up to now. I've listed some study ideas below. Not everything on the exam is necessarily on this list, and the list certainly too long to have every topic included in a one-hour exam! The exam will cover all of special relativity except for Maxwell's equations.

- What is a group?
- Know how to compute change of inertial coordinates in 1+1 dimension using boosts and translations. If inertial observer $\hat{O}$ is moving with velocity v with respect to inertial observer O, what possible coordinate transformations connect them?
- Know what proper time/proper distance are. How do you compute the proper time between two points? How do you compute proper time along a curve?
- Be able to make arguments involving Lorentz contraction and time dilation.
- What is the official definition of a Lorentz transformation in 1+3 dimensions?
- What is rapidity? Why is this a helpful notion?
- Given a curve $\alpha(s)$ with $\alpha'(s)$ future pointing and timelike, what is the associated 4-velocity at parameter s?
- Given a 4-momentum or a 4-current, how do you determine the energy or density determined by an observer with 4-velocity U?
- Given an observer with 4-velocity U and a particle with 4-momentum V, what operations yield the energy of V measured by U?
- Why does density/flux transform like a vector?
- Be able to show that 4-velocity transforms like a vector.
- Given an example of something that transforms like a covector, and be able to show that it really does transform like a covector.
- What is 4-acceleration? How is it related to curvature of a curve? How is it related to rapidity? Why is this a vector and not a covector?
- What is 4-momentum? What rules govern collisions? What in the heck does $E = mc^2$ come from?
- What is the wave equation? Show that the wave equation is invariant under Lorentz transformations. What are the solutions of the wave equation in 1+1 dimensions? Given Cauchy data $u(0, x) = \phi(x)$ and $u_t(0, x) = \psi(x)$, what is the associated solution of the wave equation?