Electrodynamics, PHYS832
Problem Set 2
Due: Friday, January 28, 2011

1. Jackson, 11.6. Hint: Use the result from Problem 11.5 where K' is the (instantaneous) position of the particle, so that $\mathbf{u}' = 0$, $a'_{\parallel} = g$ and $\mathbf{a}'_{\perp} = 0$. Solve for $v(t)$ by integrating the equation for $a_{\parallel} = dv/dt$. You might find the change in variables $v/c = tanh(\psi)$ useful (and note that ψ is the rapidity!). Proceed to integrate $v(t)$ to get $x(t)$.

2. *Car and garage paradox* A car and garage have equal proper length. The car speeds toward the garage with velocity $4c/5$. The doorman at the garage is instructed to slam the door shut as soon as the back end of the car enters the garage. According to the doorman, "the car Lorentz contracted and easily fitted into the garage when I slammed the door." According to the driver, "the garage Lorentz contracted and was too small for the car when I entered the garage." Use spacetime diagrams to describe the events from the frame of rest of the doorman and the frame of rest of the driver and thereby explain the paradox. Find the frame of reference in which both garage and doorman are Lorentz contracted by the same amount and draw the spacetime diagram for the problem in this frame.