Homework #2; Due Mon 2/9. Book Problems are from chapter 2; I'll write out the problems this week, but by next time you will need your own copy.

1) Problem 48; An astronaut is said to have tried to get out of a traffic ticket for running a red light (λ=670nm) by telling the judge that the light appeared green (λ=540nm) to her has she passed by in her spaceship. If this is true, how fast was the astronaut going?

2) (2 pts) Problem 57; Newton's second law is given by F=dp/dt. If the force is always parallel to the velocity, show that $F = \gamma^3 ma$. Hint: write out p in terms of v explicitly, *then* take the derivative.

3) Problem 68: The total energy of a body is found to be twice its rest energy. How fast is it moving with respect to the observer?

4) (2 pts) In last week's homework problem 2, you calculated the time of Alice's journey to a planet 8 light-years away from Earth, travelling at a constant 0.6c. You did this in both Alice's frame and in Earth's frame. Now, show explicitly that the s^2 between her launch and her arrival will have the same value in both Earth's frame and in Alice's frame.

5) (4 pts.) **Peter Quill's rocket ship is in hot pursuit of Ronan's rocket ship. Peter's ship is moving at 0.993c relative to Earth, and Ronan's ship is moving at 0.990c (also relative to Earth; both ships are moving in the same direction).**

A) What do Peter and Ronan agree to be the relative velocity between the two ships? Give your answer in terms of c. (It's not 0.003c!)

B) Make a spacetime diagram from the perspective of someone on Earth; put the origin at the event at which Peter catches up to Ronan. Label the event ("A") to be Peter's spaceship at t = -1 sec (in Earth's frame).

C) Now make another space-time diagram, with the same origin, from Peter's perspective. Use the invariance of s^2 to find the coordinates of event "A" in this new frame; show event "A" on your new diagram.