

PHY 3106, Fall 2017, Homework #2
due Thursday, Aug. 31, at 9:30 am (beginning of class)

- 1.) The transformations between coordinate systems that you were used to in PHY 2048 (or maybe on the SAT) can be written for position as:

$$x' = x - ut$$

$$y' = y$$

$$z' = z$$

- A) What am I assuming is the difference between the primed and unprimed coordinate systems here? B) What are the velocity transformations between the primed and unprimed coordinate systems (i.e., v_x, v_y, v_z).
- 2.) The mass of the electron is $9.11 \times 10^{-31} \text{Kg}$. Express this in eV/c^2 . [Please show your work.]
- 3.) A 5 Kg mass is subject to a force of 25 N. A) A resulting acceleration of 2.55 m/s^2 is measured in a particular reference frame. Is the frame an inertial reference frame? B) In a different reference frame, an acceleration of 5 m/s^2 is measured. Is this second frame an inertial reference frame? C) In a third reference frame, no acceleration is measured. Is this third frame an inertial frame?
- 4.) In your frame of reference, your body is of course at rest. However I observe your body to be travelling at constant velocity of 5 m/s. Is my reference frame an inertial frame?
- 5.) You are in a closed box, with no windows. The only object in the box with you is a scale. A) On the scale, you measure of a force of 68.0 N. Are you in an inertial reference frame? B) OK, you are upgrade to a box with a window. The box is now loaded into an airplane, which drops you from 15,000 m. As you fall, the scale records no force at all. Are you now in an inertial reference frame? C) A parachute deploys, which lowers you gently to the surface of the earth. Now are you in an inertial reference frame? D) Why?