Name: _____
ID #: _____

Physics 221 - Fall 2019
★ Homework ★
Chapter 4 & 5 - A

1) **Which of the following are approximately inertial reference frames (lets say have accelerations $<$ 1% g)?**

a) the classroom
b) a turbulence-free airplane that is traveling at constant speed and direction
c) a turbulence-free airplane that is traveling at constant speed but turning upward
d) a rapidly spinning park merry-go-round
e) a satellite orbiting the Sun at Mars' radius

2) **Space-time conversions: What is:**

a) one foot in nano-seconds?
b) one second in meters?
c) one year in meters

3) **4.7**

4) **5.8**

5) **5.10**

6) You are standing still in a reference frame, S. An object has stationary coordinates, (x', y', z') = (25, 20, 0) meters, as measured in a frame, S', moving at $u = 0.6c$, with respect to (your) S frame. Assume the coordinate systems align and have the same origin at $t = t' = 0$ and that u is in the x-direction.

a) **Use the Lorentz transformations:**

$$x' = \gamma(x - ut)$$
$$y' = y$$
$$z' = z$$
$$t' = \gamma(t - \frac{ux}{c^2})$$

to calculate the coordinates of the object measured in (your) S frame at time $t' = 1.0 \times 10^{-5}$ s (measured in the S' frame).

b) What is the S' coordinates of the object at the same t' as in a)?