

Physics 261: Random Questions 1 (from H&R)

These are questions from the end of chapters in Halliday and Resnick's book (used for the 130 series).

- (1) If the acceleration of a body is constant in a given reference frame, is it necessarily constant in all other reference frames?
- (2) Figure 24 shows the path followed by a NASA Learjet in a run designed to simulate low-gravity conditions for a short period of time. Make an argument to show that, if the plane follows a particular parabolic path, the passengers will experience weightlessness.
- (3) In projectile motion when air resistance is negligible, is it ever necessary to consider three-dimensional motion rather than two-dimensional?
- (4) Is it possible to be accelerating if you are traveling at constant speed? Is it possible to round a curve with zero acceleration? With constant acceleration?
- (5) Why do you fall forward when a moving bus decelerates to a stop and fall backward when it accelerates from rest?
- (6) Suppose that a body that is acted on by exactly two forces is accelerated. Does it then follow that (a) the body cannot move with constant speed? (b) the velocity can never be zero? (c) the sum of the two forces cannot be zero? (d) the two forces must act in the same line?
- (7) A horse is urged to pull a wagon. The horse refuses to try, citing Newton's third law as a defense: The pull of the horse on the wagon is equal but opposite to the pull of the wagon on the horse. "If I can never exert a greater force on the wagon than it exerts on me, how can I ever start the wagon moving?" asks the horse. How would you reply?
- (8) You are an astronaut in the lounge of an orbiting space station and you remove the cover from a long thin jar containing a single olive. Describe several ways—all taking advantage of the inertia of either the olive or the jar—to remove the olive from the jar?
- (9) What conclusion might a physicist draw if unequal masses hung over a pulley inside an elevator remain balanced; that is, there is no tendency for the pulley to turn?