

Homework Problem Set 3 - Solution

Question 4

One example is a ball thrown upwards: Initially, it is moving in positive (up) direction, but eventually it reaches its highest point and then starts falling back down, changing its direction. However, during this whole time, the acceleration is a constant $-g$ (-10 m/s^2) downwards.

Question 6

Going around a curve means that you change your velocity, if not in magnitude, so at least in direction. Any change in velocity means you are accelerating. Any acceleration requires a force ($F = ma$).

Question 8

The force with which I pull the wagon is exactly balanced by the force of friction acting on the cart in the opposite direction. The net force is zero, in agreement with Newton's law.

Question 9

(a) Terminal speed means that air resistance (friction) is opposing gravity so the net force is zero - the speed doesn't change. So gravity is definitely NOT the only force acting!

(b) Since the satellite is above the atmosphere, there is no air resistance (at least in this idealized example). There are also no other forces acting on the satellite (as long as it is not running a rocket engine). Therefore, gravity must be the only force acting on it - it is in "free fall". (It just keeps also moving forward because of Newton's first law, and so the Earth "curves away" underneath it at just the right rate so its free fall never gets it closer to Earth's surface).

Question 11

Upwards. You can tell because the parachute slows her down, and she is falling downwards, so the acceleration must be in the opposite direction (up).