

QP26

A football quarterback throws a ball directly at a receiver who is at rest 25 meters downfield. The ball is thrown at an angle of 30 degrees to the horizontal and with a speed of 20 meters/sec. Immediately sensing that the ball is going to over-shoot him, the receiver begins to run, with constant acceleration, downfield in the same direction the ball is travelling. Amazingly, he catches the ball. You may assume that the ball is thrown from and caught at the same height.

- a) (1 point) How far did the receiver have to run?
- b) (1 point) How long after the throw is the catch made?
- c) (2 points) What was the acceleration of the receiver?
- d) (1 point) At the time of the catch, which downfield velocity is larger, the ball's or the receiver's? By how much?
- e) (2 points) Next season the receiver decides to quit football and take up the 100 meter dash track event instead. In his first attempt, he manages a time of 10.0 seconds. Assuming that he was able to accelerate at the same rate as found above for a portion of the 100 meter race and then continue at constant speed for the remainder, determine how long the acceleration phase of his race was.