Midterm Exam 01 (2018 Spring)

PHYS 203A: College Physics

Date: 2018 Feb 12

(Name) (Signature)

Instructions

1. Seating direction: Please be seated on seats with seat numbers divisible by 3.
2. Total time = 50 minutes.
3. There are 7 questions in this exam.
4. Equation sheet is provided separately.
5. To be considered for partial credit you need to show your work in detail and organize it clearly.
6. A simple calculator (with trigonometric functions) is allowed.
7. Use of mobile phones is strictly prohibited. It should stay out of reach during the exam.

1. (**10 points.**) A highway is to be built between two towns, one of which lies 40.0 km south and 30.0 km west of the other. What is the shortest length of highway that can be built between the two towns, and at what angle would this highway be directed?

2. (**10 points.**) A golfer takes two strokes to putt a golf ball into a hole. On the first stroke, the ball moves 4.0 m at an angle 60° East of North. On the second, it moves 3.0 m at an angle 70° South of West. If the golfer had instead hit the ball directly into the hole on the first stroke, what would have been the magnitude and direction of the ball's displacement?

3. (**10 points.**) A ball is thrown vertically upward, which is the positive direction. A little later it returns to its point of release. The ball is in the air for a total time of 8.8 s. What is its initial velocity? Neglect air resistance.

4. (**10 points.**) Two soccer players start from rest, 40.0 m apart. They run directly toward each other, both players accelerating. The first player's acceleration has a magnitude of $0.50\,\mathrm{m/s^2}$. The second player's acceleration has a magnitude of $0.20\,\mathrm{m/s^2}$. At the instant they collide, how far has the first player run?

5. (**10 points.**) A hot-air balloon is rising upward with a constant speed of 4.00 m/s. When the balloon is 20.0 m above the ground, the balloonist accidentally drops a compass over the side of the balloon. How much time elapses before the compass hits the ground?

6. (**10 points.**) As a tennis ball is struck, it departs from the racket horizontally with a speed of 28.0 m/s. The ball hits the court at a horizontal distance of 20.0 m from the racket. How far above the court is the tennis ball when it leaves the racket?

7. (**10 points.**) A soccer player kicks the ball toward a goal that is 32.0 m in front of him. The ball leaves his foot at a speed of 20.0 m/s and an angle of 30.0° from the horizontal. The goalie catches the ball at the goal, in front of the net. How high above the ground did the goalie catch the ball?