Midterm Exam 01 (2017 Fall)

PHYS 203A: College Physics

Date: 2017 Sep 14

(Name) (Signature)

Instructions

1. Seating direction: Please be seated on seats with seat numbers divisible by 3.
2. Total time = 75 minutes.
3. There are 8 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.**) You are driving into St. Louis, Missouri, and in the distance you see the famous Gateway-to-the-West arch. This monument rises to a height of 192 m. You estimate your line of sight with the top of the arch to be 5.0° above the horizontal. Approximately how far (in kilometers) are you from the base of the arch?

2. (**10 points.**) The x component of a displacement vector $\vec{\mathbf{r}}$ is 116 m, while its y component is -223 m.

   (a) Find the magnitude of $\vec{\mathbf{r}}$.

   (b) Find the direction of $\vec{\mathbf{r}}$.

3. (**10 points.**) Vector $\vec{\mathbf{A}}$ has a magnitude of 6.0 units and points due West. Vector $\vec{\mathbf{B}}$ points due North. What is the magnitude of vector $\vec{\mathbf{B}}$ if $\vec{\mathbf{A}} + \vec{\mathbf{B}}$ has a magnitude of 10.0 units?

4. (**10 points.**) A golfer takes three strokes to putt a golf ball into a hole. On the first putt, the ball moves 4.0 m due East. On the second putt, it moves 2.0 m at an angle 30° South of East. The third putt is 0.50 m due South. If the golfer had instead hit the ball directly into the hole on the first putt, what would have been the magnitude and direction of the ball's displacement?

5. (**10 points.**) A small fish is dropped by a pelican that is rising steadily at 6.0 m/s when it is 10.0 m above the water level. How high above the water level does the fish rise?

6. (**10 points.**) A driver of a car applies the brakes when the car is traveling at 15.0 m/s. The car decelerates uniformly at 4.00 m/s^2. What is the stopping distance of the car? That is, how far does the car go before coming to stop.

7. (**10 points.**) A ball is thrown vertically upward. A little later it returns to its point of release. The ball is in the air for a total time of 4.0 s. What is its initial velocity? Neglect air resistance.

8. (**10 points.**) A woman on a bridge 40.0 m high sees a raft floating at a constant speed on the river below. Trying to hit the raft, she drops a stone from rest when the raft has 10.0 m more to travel before passing under the bridge. The stone hits the water 2.00 m in front of the raft. Find the speed of the raft.