Midterm Exam No. 01 (2017 Fall)

PHYS 205A-001: University Physics

Date: 2017 Sep 15

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(Name)   (Signature)

Instructions

1. Seating direction: Please be seated on seats with seat-numbers divisible by 4.

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.**) In geometry, Heron's formula

$$A = \sqrt{s(s-a)(s-b)(s-c)} \tag{1}$$

gives the area A of a triangle whose sides have lengths a, b, and c. Using dimensional analysis deduce the dimension of the variable s in the Heron formula.

Note: To be eligible for partial credit please explain your reasoning clearly.

2. (**10 points.**) The position function $x(t)$ of a particle moving along an x axis is

$$x = 5.0 - 7.0\,t^2, \tag{2}$$

with x in meters and t in seconds. Determine the position of the particle when it (momentarily) stops?

3. (**10 points.**) A truck covers 44.0 m in 8.20 s while smoothly slowing down to final speed of 2.50 m/s. Find its original speed.

4. (**10 points.**) A baseball is hit so that it travels straight upward after being struck by the bat. A fan observes that it takes $3.00\,\mathrm{s}$ for the ball to reach its maximum height. Find the ball's initial velocity.

5. (**10 points.**) The polar coordinates of a point are $r = 6.00\,\mathrm{m}$ and $\theta = 210°$. What are the Cartesian coordinates of this point?

6. (**10 points.**) Consider the vectors:

$$\vec{A} = 4.00\,\hat{i} + 2.00\,\hat{j}, \tag{3a}$$
$$\vec{B} = -5.00\,\hat{i} + 3.00\,\hat{j}. \tag{3b}$$

Draw the vector $\vec{C} = \vec{A} - \vec{B}$. Determine the magnitude and direction of vector $\vec{C}$.

7. (**10 points.**) A ball is dropped from a building's roof and passes a window, taking $0.125\,\text{s}$ to fall from the top to the bottom of the window, a distance of $1.20\,\text{m}$. Determine the height between the window top and the building's roof.