

# Midterm Exam 01 (2021 Fall)

## PHYS 203A-002: College Physics

Date: 2018 Sep 9

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### Instructions

1. Seating direction: Please be seated on seats with seat numbers divisible by 4.
2. Total time = 75 minutes.
3. There are 10 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. (5 points.) Express  $9.8 \text{ m/s}^2$  in units of  $\text{km/hour}^2$ .

2. (5 points.) Find the  $x$ -component of vector  $\mathbf{A}$  shown in Figure 1. Given the magnitude of vector  $\mathbf{A}$  is 15 m and  $\theta = 30^\circ$ .

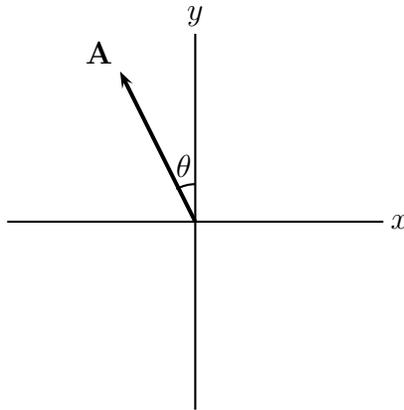


Figure 1: Problem 2

3. (5 points.) Motion of an object moving with uniform acceleration, after starting from rest, is described by the equation

$$x = \frac{1}{2}at^2, \quad (1)$$

where  $x$  is the position of the object,  $a$  is the acceleration of the object, and  $t$  is time. Plot  $x$  versus  $t$  for  $a = -2.0 \text{ m/s}^2$ .

4. (**5 points.**) A ball is thrown up in the air. What is the acceleration of the ball when it momentarily stops while at the highest point?

5. (**5 points.**) An airplane flying horizontally at a uniform speed of  $50.0\text{ m/s}$  over level ground releases a bundle of food supplies. Ignore the effect of air on the bundle. What is the horizontal component of velocity of the package right before it lands?

6. (10 points.) Deduce the dimension of  $p$  in the expression

$$E = \sqrt{m^2 c^4 + p^2 c^2}, \quad (2)$$

if  $E$  has dimensions  $ML^2T^{-2}$ ,  $m$  has dimension  $M$ , and  $c$  has dimensions  $LT^{-1}$ .

7. (10 points.) A golfer takes two strokes to putt a golf ball into a hole. On the first stroke, the ball moves 5.0 m at an angle  $30^\circ$  East of South. On the second, it moves 3.0 m at an angle  $20^\circ$  North 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?

8. **(10 points.)** A ball is thrown vertically upwards. How high did the ball go if it took 1.5 s to reach the highest point?

9. (10 points.) A fish is dropped by a pelican that is rising steadily at a speed  $4.0 \text{ m/s}$ . Determine the velocity of the fish when it reaches the water  $15.0 \text{ m}$  below.

10. **(10 points.)** A small ball rolls horizontally off the edge of a table that is 1.20 m high. It strikes the floor at a point 1.50 m horizontally from the table edge. What is its speed when it leaves the edge of the table?