

Midterm Exam No. 01 (2015 Fall)

PHYS 205A: University Physics

Date: 2015 Sep 16

(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 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.) Consider the mathematical expression, for a travelling wave,

$$y = A \cos(kx - \omega t + \delta), \quad (1)$$

where x and y are measured in units of distance, t is measured in units of time, and δ is measured in units of angle (radians, that is dimensionless). Determine the dimension of the physical quantity represented by

$$\frac{\omega}{k}. \quad (2)$$

2. (10 points.) You travel the first half segment of a trip at an average velocity of 50.0 miles/hour. What is the average velocity you should maintain during the second segment, of equal distance, to login an average velocity of 60.0 miles/hour for the total trip?

3. (10 points.) Starting at time $t = 0$, an object moves along a straight line. Its coordinate in meters is given by

$$x(t) = 24t - 2.0t^3, \quad (3)$$

where t is in seconds. Determine the acceleration when it momentarily stops?

4. **(10 points.)** A truck covers 44.0 m in 2.00 s while smoothly slowing down (decelerating) at the rate of 3.00 m/s^2 . Find its final speed.

5. (**10 points.**) A hockey player is standing on his skates on a frozen pond when an opposing player, moving with a uniform speed of 2.0 m/s , skates by with the puck. Immediately, the first player begins to chase his opponent. If he accelerates uniformly at 0.20 m/s^2 , how long does it take him to catch his opponent? (Assume the player with the puck remains in motion at constant speed.)

6. **(10 points.)** A man pushing a mop across a floor causes it to undergo two displacements. The first has a magnitude of 44 cm and makes an angle of 40° anticlockwise with the positive x axis. The second displacement has a magnitude of 88 cm and is directed at an angle of 45° clockwise to the negative x axis. Find the magnitude and direction of the resultant displacement.

7. **(10 points.)** An airplane flying horizontally at a uniform speed of 20.0 m/s over level ground releases a bundle of food supplies. (Ignore the effect of air on the bundle.) The bundle is dropped from a height of 400.0 m . Determine the horizontal distance covered by the bundle while it is in the air.

8. **(10 points.)** A placekicker must kick a football from a point 36.0 m (about 40 yards) from the goal. Half the crowd hopes the ball will clear the crossbar, which is 3.05 m high. When kicked, the ball leaves the ground with a speed of 20.0 m/s at an angle of 45.0° to the horizontal. By how much does the ball clear or fall short of clearing the crossbar?