

General Physics  
Physics 101  
Test #1 – Spring 2017  
Friday 2/10/17  
Prof. Bob Ekey

Name (print): \_\_\_\_\_

I hereby declare upon my word of honor that  
I have neither given nor received unauthorized  
help on this work.

Signature: \_\_\_\_\_

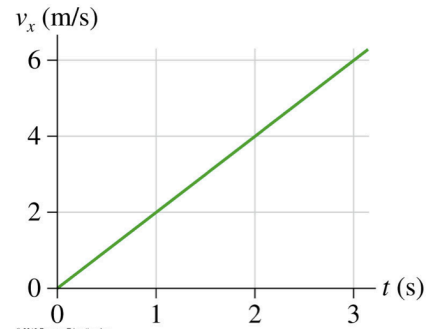
## Part I. Multiple Choice (3 pts each)

### Instructions:

Please clearly circle one and only one answer for each of the following.  
Show all of your work. Partial credit may be given if you include your work.

### Questions:

1. The following velocity versus time graph shows a particle moving along the x-axis. Its initial position is  $x_0 = 2.0$  m at  $t_0 = 0.0$  s. At  $t = 3.0$  s, what is the particle's position?



- (a) 9.0 m
- (b) 11.0 m
- (c)  $4.0 \text{ m/s}^2$
- (d) 2.0 m

2. You are testing your golf skills at a local driving range, where the ground is level. How long will a golf ball spend in the air if after the hit it travels at 100 m/s at an angle of  $60.0^\circ$  above the ground?

- (a) 17.7 s
- (b) 8.84 s
- (c) 20.4 s
- (d) 5.10 s

3. A bike is traveling at 10.0 m/s slows uniformly over 141 m. What is the acceleration of the bike if the velocity is now 4.0 m/s?

- (a)  $-1.5 \text{ m/s}^2$
- (b)  $0.2979 \text{ m/s}^2$
- (c) 0.13 m/s
- (d)  $-0.30 \text{ m/s}^2$



4. Larry leaves home at 9:05 and runs at a constant speed to the lamppost. He reaches the lamppost at 9:07, immediately turns around and runs to the tree. Larry arrives at the tree at 9:10. What is Larry’s average speed for the entire run? Keep 3 sig figs.

- (a) +280 m/min
- (b) -200 m/min
- (c) +333 m/min
- (d) +120 m/min

5. Which of the following statements is false?

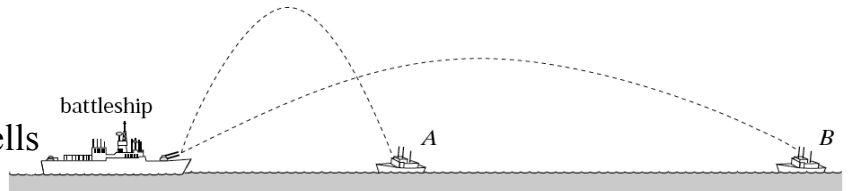
- (a) The acceleration points down a ramp regardless of whether the object is moving up or down the ramp.
- (b) The unit “candela” is an SI base unit.
- (c) In projectile motion, the velocity can be non-zero at the maximum height.
- (d) A vector can have a zero mag. & have one of its components be nonzero



6. For the following motion diagram, which are true?

- I. The position is positive
  - II. The object has negative velocity
  - III. The object has positive acceleration
- (a) II only
  - (b) II and III
  - (c) I, II and III
  - (d) I and II

7. A battleship simultaneously fires two shells at enemy ships. If the shells follow the parabolic trajectories shown, which ship gets hit last?



- (a) both are hit at the same time.
- (b) A
- (c) B
- (d) Not enough information given.

8. You derived the following equation, but you still have to figure out the units of the answer... what are they?

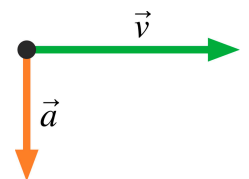
$$\frac{1}{t^2} \left( \frac{a}{v} \right) = \text{units?}$$

- (a)  $\frac{m^2}{s^5}$
- (b)  $\frac{1}{s^5}$
- (c)  $s^{-3}$
- (d)  $m^2 s^{-3}$

9. Lego Batman coasts his Lego Batmobile up a  $20^\circ$  ramp with the engine off. If the initial velocity is 10.0 m/s, how long does it take until it is traveling at -5.00 m/s?

- (a) 0.51 s
- (b) 4.5 s
- (c) 1.5 s
- (d) 0.29 s

10. For the particle at the instant of the acceleration shown, which of the following is not possible to state from the information given?



- (a) It has a constant speed
- (b) It has a changing velocity
- (c) It travels in a parabolic path
- (d) It has an acceleration perpendicular to the motion

11. A stunt man drives a car off a 10.0 m high cliff at a horizontal speed of 20.0 m/s. How far does the car land from the base of the cliff?

- (a) 28.6 m
- (b) 1.43 m
- (c) 18.6 m
- (d) 10.0 m

12. Sparky, the dog, is running around in a field. He starts by running west for 20 m. Then sees a squirrel and bolts 10 m north. Sparky then makes you think about vectors by running  $(10\hat{i} + 20\hat{j})m$ . What is his total displacement?

- (a)  $(-10\hat{i} + 30\hat{j})$
- (b) (30m E, 30m N)
- (c)  $(20\hat{i} + 0\hat{j})m$
- (d) 30 m to the North, 10 m to the West

## Part II. Short answer problems (12 pts each)

### Instructions:

Solve three of the following four problems. If you try to solve all four problems, please clearly indicate which problems you wish to have graded. If you do not indicate this, I will assume you want me to grade problems one, two and three.

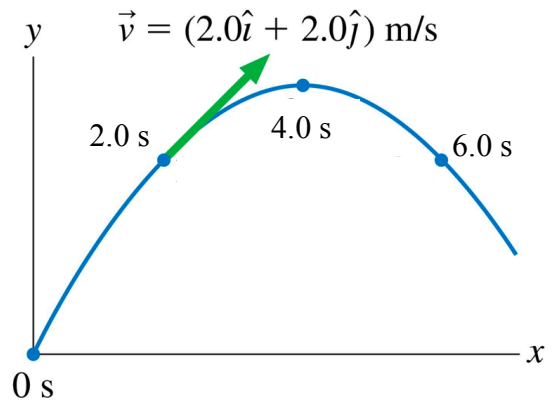
Please show all of your work, including equations without numbers.

Please provide units with all answers.

Partial credit may be given if you include your work.

**Question 1.**                    **Grade this problem? Yes or No (circle one)**

A physics student on the planet Exidar throws a ball, and it follows the parabolic trajectory shown. The velocity vector for  $t=2.0$  seconds is also shown.



(a) What are the components of the velocity at 6.0 s? Be sure to explain your answer with words and theory.

(b) What is the acceleration does the ball experience on planet Exidar?

(c) What is the vertical displacement of the ball from 2.0 s to 4.0 s?

(d) What is the launch angle?

**Question 2.**

**Grade this problem? Yes or No (circle one)**

A photographer in a helicopter ascending vertically at a constant rate of 12.5 m/s accidentally lets go of a camera dangling out the window when the helicopter is 60.0 m above the ground. Ignore air resistance.

(a) Explain the velocity and acceleration of the camera the moment after it is released. Be sure to explain your answer with theory and words.

(b) What will the camera's velocity right before it hits the ground?

(c) How long will the camera take to reach the ground?

(d) As the camera impacts the ground it comes to rest in 9 ms. What is the acceleration of the camera? Be sure to state the direction of the acceleration.

**Question 3.** **Grade this problem? Yes or No (circle one)**

For the following position versus time graph do the following,

(a) Sketch the velocity versus time.

What knowledge/definition are you using to make this sketch?

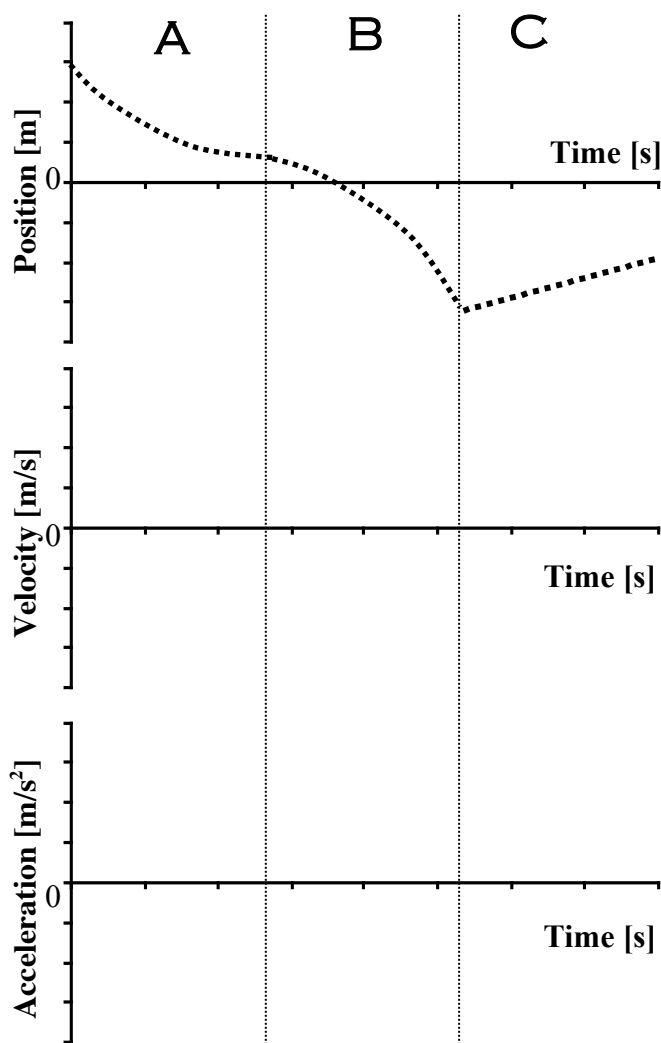
(b) Sketch the acceleration versus time.

What knowledge/definition are you using to make this sketch?

Note: You do not need to provide any numbers in your answers.

Note: On the velocity vs. time graph all lines should be straight - sloped or horizontal

Note: Your sketches and description will be graded independently.



(c) In each section (A-C) describe the motion.  
(x, v and a)



**Question 4.**

**Grade this problem? Yes or No (circle one)**

A Porsche accelerates from a stoplight at  $5.0 \text{ m/s}^2$  for 5.0 seconds then coasts for 25 meters.

(a) Draw a full motion diagram for the motion of the car from the instant the light turns green to the end of the motion described. Be sure to clearly label the start and end of the motion in question.

(b) What is the velocity of the Porsche after the acceleration?

(c) How far did the Porsche travel during the acceleration?

(d) How long did it take the Porsche to travel from the light to the end of the coast?