

General Physics  
Physics 101  
Test #1 – Fall 2019  
Friday 9/20/19  
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. I'm gonna take my horse to the old town road. I'm gonna ride 'til I can't no more. The road starts by running west for 20 mi and then heads 10 mi north. Finally, the road travels in a vector like fashion  $(10\hat{i} + 20\hat{j})$  mi 'til I can't no more. What is your total displacement during this journey?

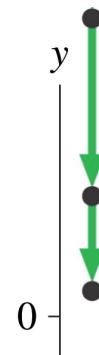
- (a)  $(-10\hat{i} + 30\hat{j})$
- (b) (30 mi E, 30 mi N)
- (c) 30 mi to the North, 10 mi to the West
- (d)  $(-20\hat{i} + 0\hat{j})$  mi

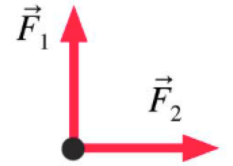
2. You launch a ball of mud vertically upward and it hits the ceiling 0.500 seconds later. What is the launch velocity of the ball, if the distance from launch to the ceiling is 100 in?

- (a) 8 m/s
- (b) 7.53 m/s
- (c) 200 m/s
- (d) 2.63 m/s

3. For the following diagram, what is true?

- (a) Position is negative
- (b) Acceleration is positive
- (c) Velocity is constant
- (d) Velocity is increasing





4. Three forces are acting on the same point and the system is in equilibrium (Total/Net force is zero). If  $F_1$  and  $F_2$  are equal to 4.0 N each. What is the magnitude and direction of the 3<sup>rd</sup> balancing force?

- (a) 8.0 N to the North East
- (b) 8.0 N to the South West
- (c) 5.7 N to the North East
- (d) 5.7 N to the South West

5. Ball A is released from rest 2.0 m above a flat, horizontal surface. At exactly the same instant, Ball B with the same mass is fired horizontally at 3.0 m/s also from 2.0 m above the same surface. Which ball hits the ground first?

- (a) A
- (b) B
- (c) both at the same time
- (d) impossible to determine with the information given

6. A vat has a volume of  $100 \times 10^1 \text{ cm}^3$ . What is the SI equivalent value for this volume?

- (a)  $0.001 \text{ m}^3$
- (b)  $1.00 \times 10^{-3} \text{ m}^3$
- (c)  $10.0 \text{ m}^3$
- (d)  $1.00 \times 10^{-4} \text{ m}^3$

7. An object moves from A to B to C.

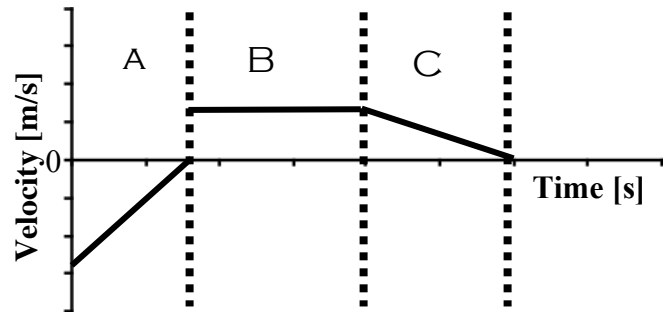


What is the direction of the acceleration vector?

- (a) North-East
- (b) South-West
- (c) North-West
- (d) South-East

A ●

8. For the following velocity vs. time graph, which statement is false?

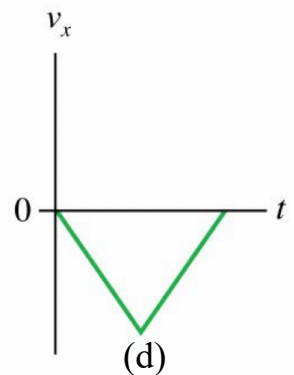
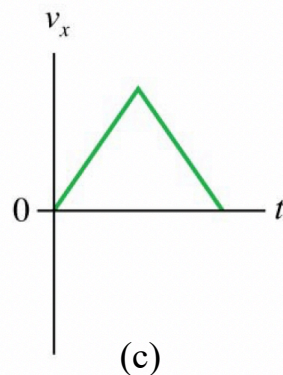
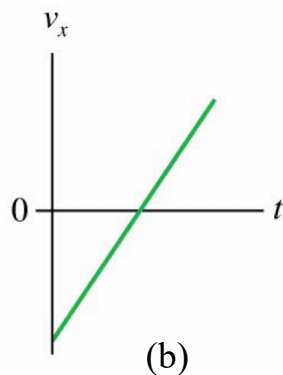
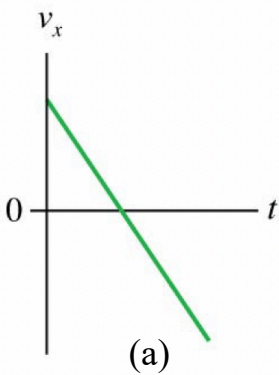
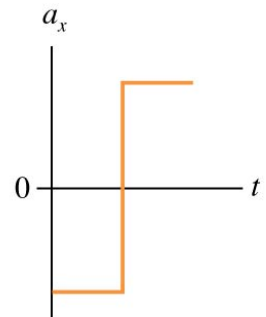


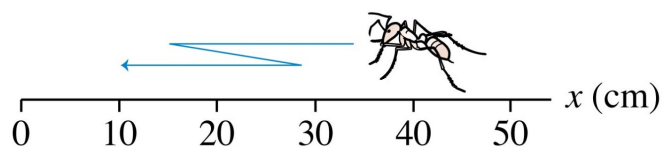
- (a) The velocity in B is zero.
- (b) The magnitude of acceleration in A is greater than the acceleration in C.
- (c) The object has a negative decreasing velocity in A.
- (d) The object is moving in the negative direction in A.

9. An ice rink has a slight tilt. To determine the angle of tilt, you release a hockey puck from rest and it takes 10 seconds to achieve a velocity of 2.0 m/s. What is the angle of the incline with respect to the horizontal?

- (a)  $1.2^\circ$
- (b)  $0.02^\circ$
- (c)  $3.6 \times 10^{-4}$  degrees
- (d)  $0.20^\circ$

10. Which velocity versus time graph could go with the acceleration vs time graph?





11. An ant zig-zags back and forth on a picnic table as shown. What is the ant's displacement?

- (a) 60 cm
- (b) 50 cm
- (c) -30 cm
- (d) -50 cm

12. A lumber jack throws his axe at 10 m/s at an angle of  $40^\circ$  above the horizontal. If the axe imbeds in a tree at the same height as the throw, how far away was the tree from the lumber jack?

- (a) 10 m
- (b) 5.0 m
- (c) 16 m
- (d) 7.8 m

## 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 tennis player hits a ball 2.0 m above the ground. The ball leaves his racquet with a speed of 25.0 m/s at a  $10.0^\circ$  angle above the horizontal ( $v_x = 24.6$  m/s ,  $v_y = 4.34$  m/s).

(a) If the horizontal distance to the net is 7.0 m, how long does it take the ball to reach the net?

(b) What vertical distance from the ground is the ball as it reaches the net?

(c) What is the vertical velocity of the ball right before it lands on the ground?

(d) If the player hits the ball at the same initial location with the same vertical velocity but half the horizontal velocity, how does the total flight time from hit to landing change? Does it increase, decrease or stay the same? Please justify your answer with words and possibly equations.

**Question 2.** **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?

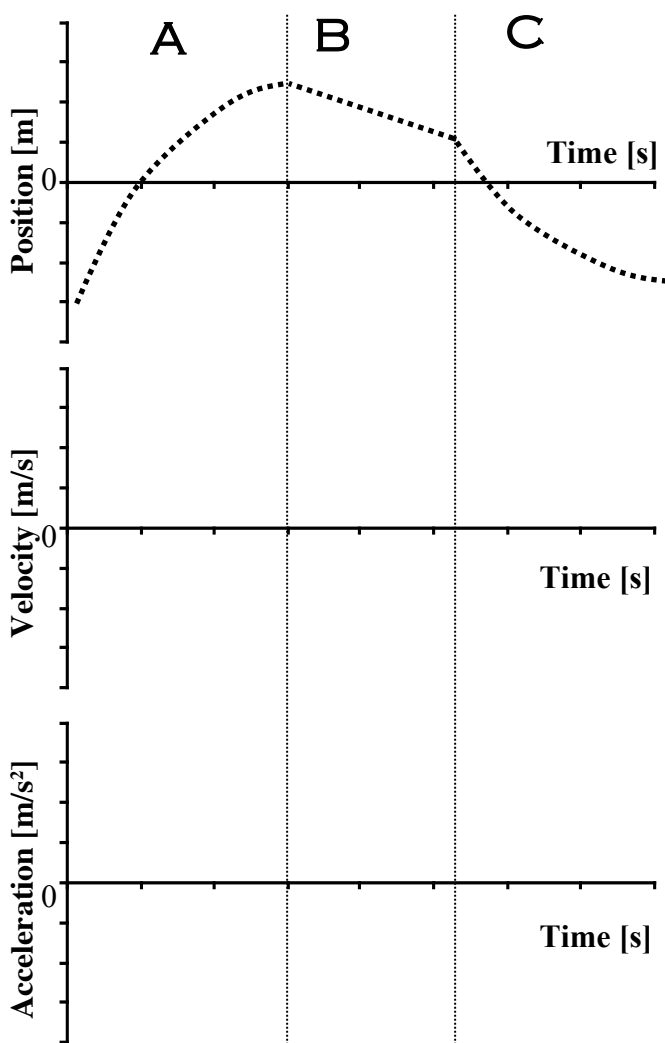
(b) Sketch the acceleration versus time.

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

You are driving to the grocery store at 20 m/s. You are 110 m from an intersection when the traffic light turns red. Assume that your reaction time is 0.50 s and that your car breaks with constant acceleration.

(a) Draw a complete motion diagram of the motion

(b) How far are you from the intersection when you begin to apply the brakes?

(c) What acceleration will bring you to rest right at the intersection?

(d) How long does it take you to brake?

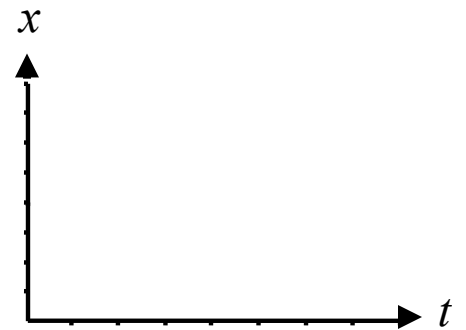


**Question 4.**      **Grade this problem? Yes or No (circle one)**

A jet plane is cruising at 300 m/s and steadily slows to 200 m/s after traveling for 5.0 minutes.

(a) What is the acceleration of the jet, assuming it is constant?

(b) Sketch a position vs time plot that could represent the motion of the plane  
Please explain the shape & meaning of the graph.



(c) How far does the jet travel during this motion?

(d) What is the velocity of the jet when it is at half of the displacement in (c)?