

General Physics
Physics 101
Test #1 – Fall 2009
Friday 10/2/09
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. A bus traveling at 10.0 mi/hr and must stop to pick up more passengers.
If it takes 10.0 seconds to stop, what is its acceleration?

- (a) -0.5 m/s^2
- (b) -1.00 m/s^2
- (c) -0.447 m/s^2
- (d) -2.24 m/s^2

2. You're riding on a train, which is traveling with a constant velocity.
Bored, you decide to drop a ball from the ceiling of the train.
When it lands on the train floor, where does it land?

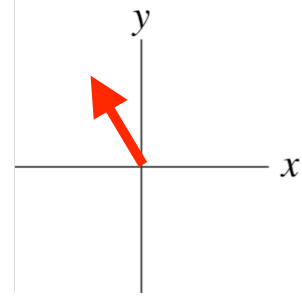
- (a) directly below where it was dropped
- (b) ahead of where it was dropped
- (c) behind where it was dropped
- (d) not enough information given

3. 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 velocity for the entire run?



- (a) $+280 \text{ yd/min}$
- (b) -200 yd/min
- (c) $+333 \text{ yd/min}$
- (d) $+120 \text{ yd/min}$

4. Which of the following statements/expressions
Could not describe the vector shown.



- (a) $\vec{r} = 10 \text{ m}$, 30° to the left of $+y$ -axis
- (b) $\vec{v} = (10 \text{ m/s}) \hat{i} - (15 \text{ m/s}) \hat{j}$
- (c) $\vec{a} = (-5 \text{ m/s}^2, 10 \text{ m/s}^2)$
- (d) $\vec{F} = 10 \text{ N}$, 120° from the $+x$ -axis

5. A ball is thrown toward a cliff of height h , and lands on the cliff 4.0 seconds later. If the ball's initial velocity was 15.0 m/s in the x -direction and 26.0 m/s in the y -direction, what was the maximum vertical distance the ball reaches?

- (a) 25.6 m
- (b) 34.5 m
- (c) 11.5 m
- (d) 182 m

6. Walking from here to there, you discover that you walked 4.0 miles north and 3.0 miles east. What displacement (magnitude and direction) do you have to travel from there to here?

- (a) 7.0 miles at angle of 53° South of West
- (b) 7.0 miles at angle of 37° South of West
- (c) 5.0 miles at angle of 53° South of West
- (d) 5.0 miles at angle of 37° South of West

7. You drop a rock from rest on the moon, where the acceleration due to gravity is about $1/6$ of that on the Earth. What is the velocity of the rock, when it strikes the ground 1.0 m below?

- (a) 3.3 m/s
- (b) -1.8 m/s
- (c) -4.4 m/s
- (d) 1.3 m/s

8. You just purchased some land that covers an area of 0.494 square furlongs. If 1 furlong equals 201.168 meters, what is this area in m^2 ?

- (a) $1.22 \times 10^{-5} \text{ m}^2$
- (b) $19,991 \text{ m}^2$
- (c) 99.4 m^2
- (d) $2.00 \times 10^4 \text{ m}^2$

9. For the following diagram, what is false.

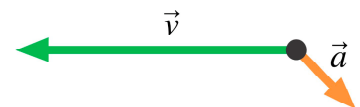


- (a) Velocity is decreasing
- (b) Acceleration is negative
- (c) Velocity is negative
- (d) Position is negative

10. A ball is rolling off a level table with a horizontal velocity of 2.0 m/s. If the ball falls a vertical distance of 1.0 m, how far did the ball travel in the x-direction?

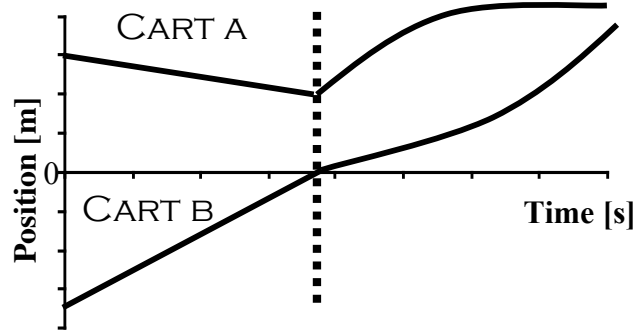
- (a) 0.90 m
- (b) 2.2 m
- (c) 0.63 m
- (d) 0.41 m

11. The acceleration shown will cause the particle to



- (a) Speed up and curve upward.
- (b) Slow down and curve upward.
- (c) Speed up and curve downward.
- (d) Slow down and curve downward.

12. For the following position vs. time graph, what is true?



- (a) CARTS A and B have the same acceleration at some point in the motion.
- (b) CART B moves in the negative direction at some point in the motion.
- (c) CARTS A and B have the same instantaneous velocity at some point in the motion.
- (d) CART A has a negative decreasing velocity at some point in the motion.

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)**

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?

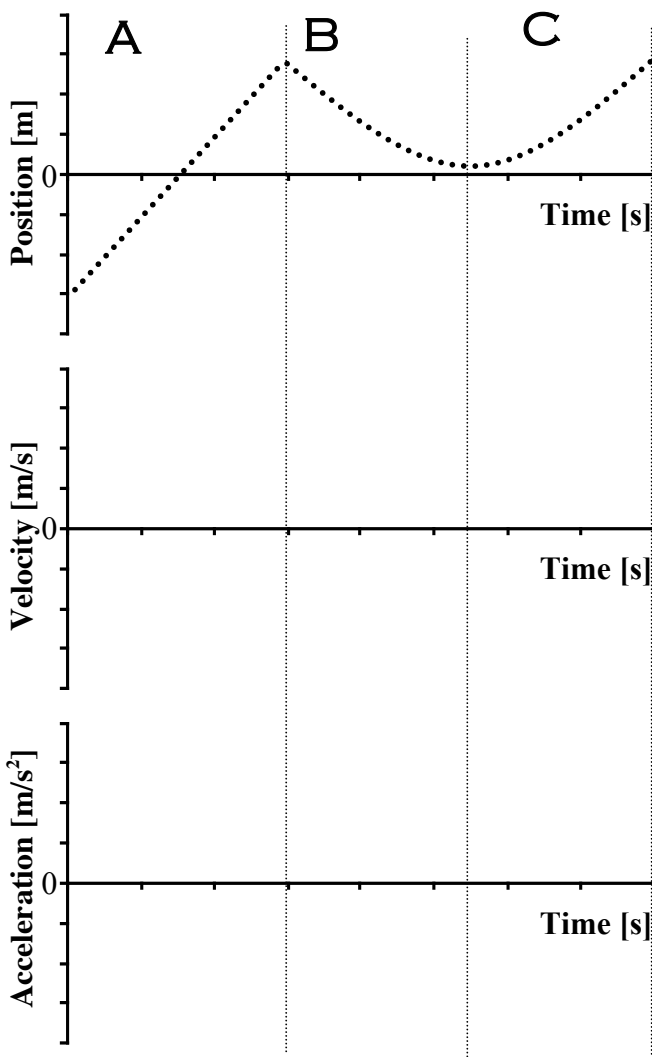
(b) Sketch the acceleration versus time.

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 2.

Grade this problem? Yes or No (circle one)

One of your dreams is to learn how to fire a cannon properly. You have a training cannon that can fire a cannon ball with a speed of 100 m/s at a fixed angle of 60.0° above the horizontal. Ignore air resistance.

(a) Calculate the x & y components of the cannon ball's velocity as it leaves the cannon.

(b) Assuming the cannon and target are at the same altitude, calculate the time the cannon ball will spend in the air.

(c) Calculate the horizontal distance traveled by the cannon ball.

(d) At the top of the motion, what is the magnitude and direction of the velocity of the ball? Words are necessary to explain, what is happening at this point.

Question 3.

Grade this problem? Yes or No (circle one)

You're getting on an airplane and flying home. You've strapped yourself into your seat, and the flight attendant threw you a bone and said you could keep your stopwatch out during take-off. At the instance the plane begins to constantly accelerate down the runway from rest, you time how long it takes to travel the 0.50 km distance before lifting off. Note: This is 1D motion in the x-direction.

(a) Draw a motion diagram for this situation including the velocity and acceleration vectors and labeled starting and take off position.

(b) If it took 10 seconds to travel 0.50 km. What is your acceleration?

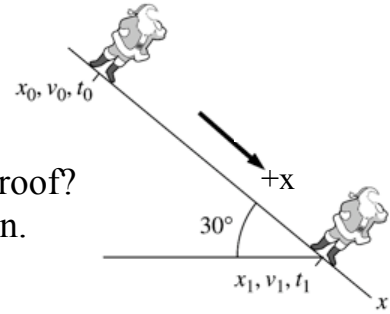
(c) Using your understanding of the definitions of acceleration and velocity Explain the sign of your acceleration.

(d) What is the final speed the plane reaches before lifting off?

Question 4.

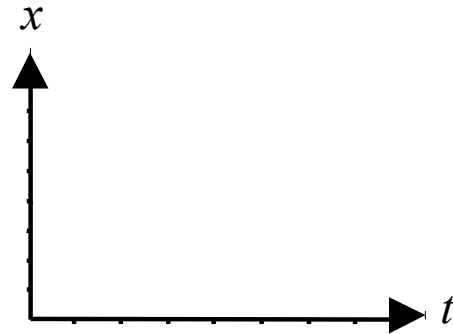
Grade this problem? Yes or No (circle one)

Ho, Ho, No! Santa loses his footing and slides down a frictionless, snowy roof that is tilted at an angle of 30° as shown.



- (a) What is the acceleration of Santa as he slides down the roof?
Explicitly state the direction of the acceleration.

- (b) Sketch a possible position vs time plot that could represent Santa's motion on the roof.
Please justify/explain your graph.



- (c) If Santa slides 10 m before reaching the edge, what is his speed as he leaves the roof?

- (d) Immediately after sliding Santa leaves the roof, is the magnitude of Santa's acceleration, more than g , equal to g , or less than g . Explain.