General Physics
Physics 101
Test #1 – Fall 2010
Friday 10/1/10
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:

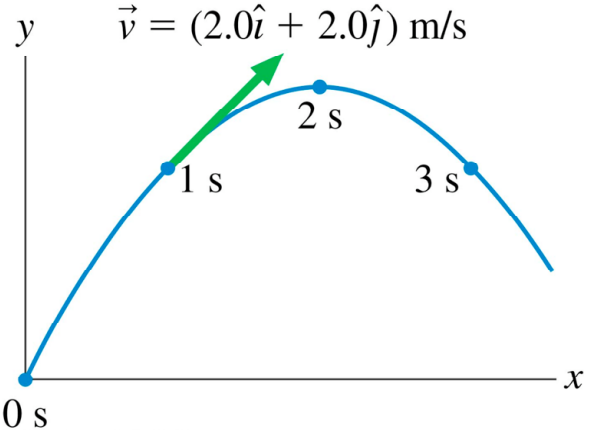
1. The particle in the motion diagram shown is

(a) Speeding up
(b) Slowing down
(c) Moving at constant velocity
(d) Need more information

2. A clown car traveling at 10.0 km/hr on a straight level road undergoes an acceleration of 1.00 m/s^2 for 10.0 seconds. How far do the clowns travel in 10.0 s?

(a) 22.2 m
(b) 50.0 m
(c) 77.8 m
(d) 150 m

3. A physics student on the planet Exidor throws a ball, and it follows the parabolic trajectory shown. The velocity vector for t=1 second is also shown. From this information, what is the velocity at t=3.0 seconds?



(a) $\vec{v} = (2.0\hat{i} - 2.0\hat{j})\ \ m/s$
(b) $\vec{v} = (2.0\hat{i} + 2.0\hat{j})\ \ m/s$
(c) $\vec{v} = (2.0\hat{i} - 2.8\hat{j})\ \ m/s^2$
(d) $\vec{v} = (-2.0\hat{i} + 2.0\hat{j})\ \ m/s$

4. A ball rolls along a smooth horizontal floor at 10 m/s then starts up a 20º ramp. What distance does it travel along the ramp before rolling back down?

(a) 1.5 m
(b) 15 m
(c) 5.1 m
(d) 7.5 m

5. A student derives an equation of the form $\frac{a}{v^2}$.
What are the combined SI base units for this equation?

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

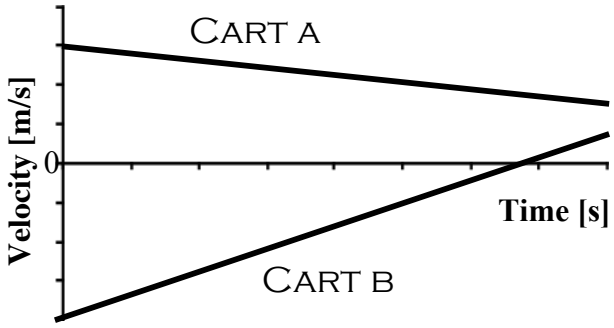
6. Ball A at a constant speed on a level table 1.0 m above the floor, and ball B rolls on the level floor directly under the first ball and with the same speed and direction. When ball A rolls off the table and hits the floor,

(a) Ball B is ahead of Ball A.
(b) Ball A and Ball B collide.
(c) Ball A is ahead of Ball B.
(d) Need more information.

7. An acceleration vector is given as: $\vec{a} = (10\ \ m/s^2,\ 40°\ left\ \ of\ \ negative\ \ y-axis)$
Which of the following is a correct vector component?

(a) a_y = -7.7 m/s^2
(b) a_x = 6.4 m/s^2
(c) a_x = -7.7 m/s^2
(d) a_y = -6.4 m/s^2

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



(a) CARTS A and B never 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) CART A has a positive decreasing velocity at some point in the motion.

(d) Neither CART A or B changes direction during the motion.

9. You have a training cannon that fires a cannon ball with a speed of 100 m/s at a fixed angle of 60.0º above the horizontal. If the target lies at the same altitude as the cannon, how long would the cannon ball spend in the air? Ignore air resistance.

(a) 10.2 s
(b) 17.7 s
(c) 8.84 s
(d) 20.4 s

10. Which of the following statements are false

I. A vector can have a component equal zero & still have a nonzero magnitude
II. A vector can have a zero mag. & have one of its components be nonzero
III. Two vectors of unequal magnitudes cannot add to zero.

(a) I, II and III
(b) II and III
(c) II only
(d) III only

11. A child on a scooter is traveling to the left at a speed of 4.0 m/s and experiences an acceleration to the right of magnitude 2.0 m/s^2. What is the velocity of the scooter after the child travels a distance of 1 m?

(a) -3 m/s
(b) -2.23 m/s
(c) 4.47 m/s
(d) 3.46 m/s

12. An object moves from A to B to C.
What is the direction of the acceleration vector?

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

The Society of Physics Students is hosting an observation night tonight on the rooftop of Bracy from 8-10 PM. If it is cloudy they won't be able to observe, but they could throw an old computer monitor over the railing to observe the beautiful projectile motion. The initial velocity of the monitor as it leaves the railing was 2.0 m/s in the horizontal direction. They estimated it took 2.0 seconds to hit the ground.

(a) How far off the ground is the railing?

(b) How far did the monitor travel from the ledge in the horizontal direction?

(c) What are the x and y components of the final velocity of the monitor right before it hits the ground?

(d) If they were to throw another monitor that was twice as massive at an initial horizontal velocity that was twice as great. Would the flight time of this second throw be greater than, less than or the same as the initial throw? No calculations are required, but words are necessary to explain/justify your answer.

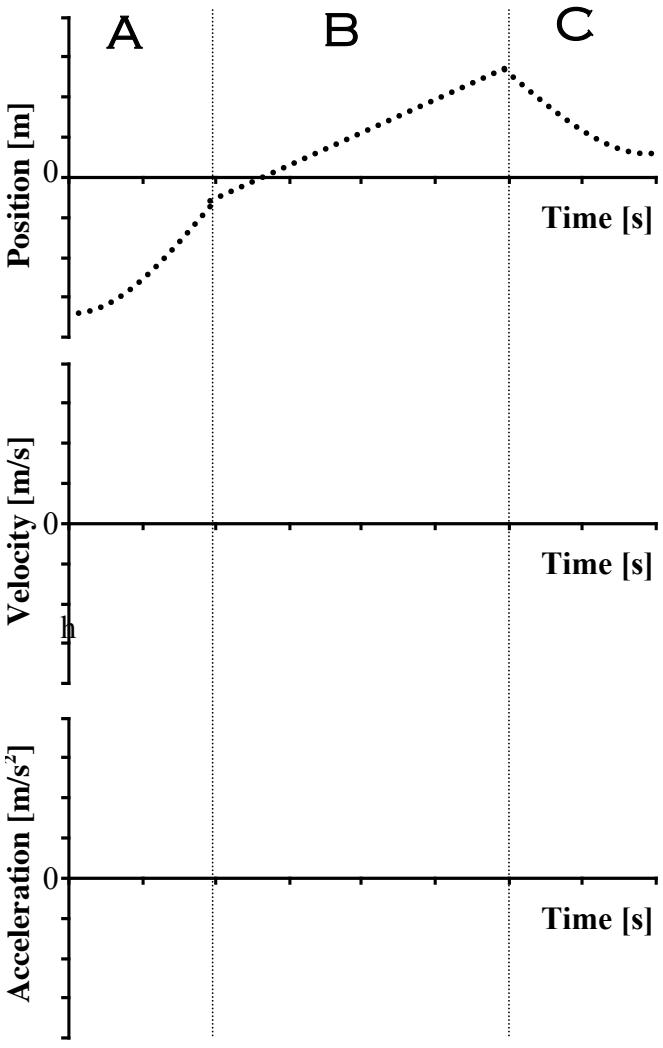
Question 2. **Grade this problem? Yes or No (circle one)**

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.



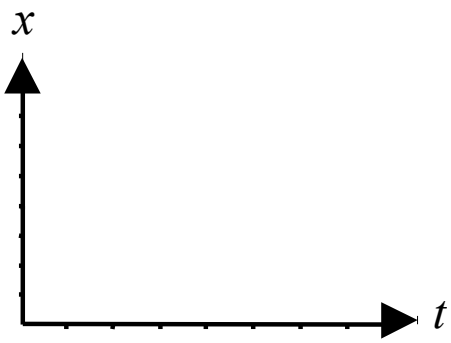
(c) In each section (A-C) describe the motion.
(x, v and a)

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

The engine in your ice sled has failed and you are sliding with a velocity of 10 m/s in the middle of a large icy lake. With the minimal friction the sled travels 100 m before coming to rest.

(a) Draw a motion diagram for this situation including the velocity and acceleration vectors and labeled starting and final positions & velocities.

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



(c) Determine the magnitude and direction of the sled's acceleration.

(d) How long did it take for the sled to come to a stop?

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

You and a friend are playing air hockey at a local establishment. As you hit the puck back and forth you have a stark revelation that you may have learned a bit of physics, which you can apply to this situation. You marvel at the near friction free environment (ignore friction), and have assumed the positive direction points from you to your friend.

(a) To get the puck going in one direction with a velocity of 10 m/s you hit it with a constant force over a time of 0.010 seconds. What is the acceleration of the puck?

(b) After you hit the puck, it traveled straight from you to your friend in 0.20 s with a constant velocity. How far did the puck travel?

(c) Your friend hits an amazing shot, and the puck returns to you at a speed of 10 m/s. Using the definitions of acceleration and velocity, explain the direction (sign) of the acceleration of the puck during your friends shot. No calculation required.

(d) If the entire trip from you to your friend and back took 0.40 seconds.
What is the average velocity of the puck as it travels during the entire motion?