# General Physics
# Physics 101
# Test #1 – Spring 2013
# Friday 2/15/13
# 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 rockets on a spaceship fire for 1.0 second, causing it to accelerate at -10 m/s$^2$. If the final velocity of the spaceship is -10 m/s, what was its initial velocity?

(a) 0.0 m/s
(b) -20 m/s
(c) -10 m/s
(d) 20 m/s

2. What are the components of the total displacement for the following motion?

I. Crawling with components $\left(10\hat{i} + 20\hat{j}\right)m$

II. Walking west for 20 m

III. Running north for 10 m

(a) $\left(-10\hat{i} + 30\hat{j}\right)$

(b) $\left(30m\ E, 30m\ N\right)$

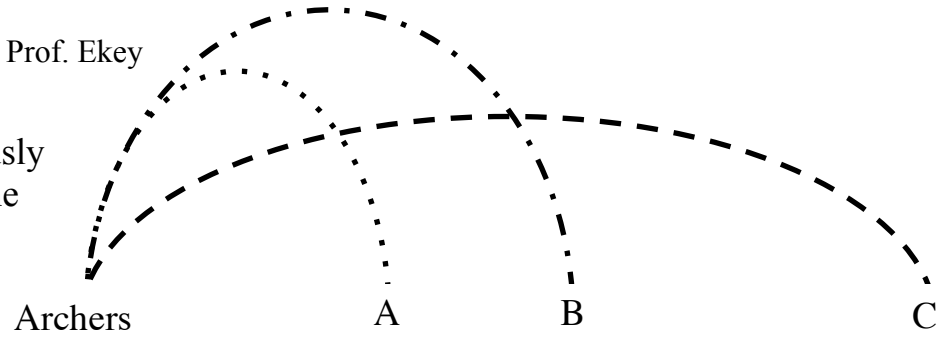
(c) 30 m to the North, 10 m to the West

(d) $\left(20\hat{i} + 0\hat{j}\right)m$

3. A cannon is aimed at an angle of 45º above the horizontal, and launches a cannon ball with an initial speed of 30 m/s. How far does the ball travel in the horizontal direction? Assume the start and stop altitude are the same.

(a) 4.3 m
(b) 92 m
(c) 184 m
(d) 46 m

4. Three archers simultaneously fire arrows into the air. If the arrows follow the parabolic trajectories shown, which target gets hit 2nd?




(a) A
(b) B
(c) C
(d) need more information

5. Davey Jones' Locker has a door that has an area of 1 fathom$^2$. If one fathom is equal to 1.829 m, what is the area in SI units?

(a) 3.345 m$^2$
(b) 1.8 m$^2$
(c) 3 m$^2$
(d) 0.3 m$^2$

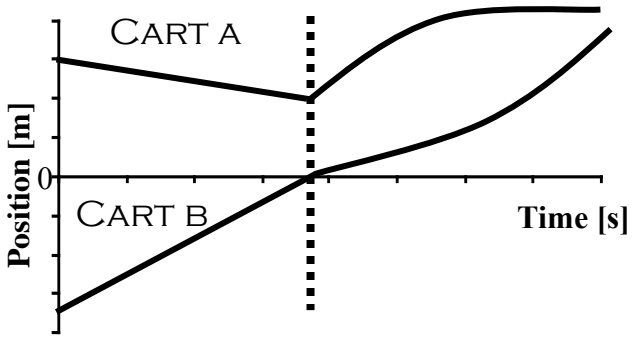

6. An object moves from A to B to C.
What is the direction of the acceleration vector?


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

7. A car is traveling at 10.0 mph, experiences a uniform acceleration for 10.0 s, and it travels a displacement of 10.0 m. What acceleration does the car experience?

(a) -1 m/s$^2$
(b) -0.694 m/s$^2$
(c) -1.10 m/s$^2$
(d) 0.477 m/s$^2$

8. For the following position vs. time graph, what is true during the motion? Ignore the transition between the 1st and 2nd part of the motion (dotted line).




(a) CART A has a positive increasing velocity at some point.

(b) CART B moves in the negative direction at some point.

(c) CARTS A and B have the same acceleration at some point.

(d) CART A has a negative decreasing velocity at some point.

9. Samuel J. drops a box of snakes from a plane that is traveling horizontally at 115.0 m/s at a height of 1050 m above the ground. With what magnitude of velocity does the box hits the ground?

(a) $1.8 \times 10^2$ m/s
(b) 143.4 m/s
(c) $2.585 \times 10^2$ m/s
(d) 183.9 m/s

10. For the following motion diagram, what is false?


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

11. A woman pushes a cart from rest across a level floor with a small constant acceleration. If the woman stops the cart and pushes it from rest with double the original acceleration, what is a correct description of the carts subsequent motion? Ignore friction

(a) The cart moves with a constant speed that is bigger than the original speed.
(b) The speed of the cart is the same in either situation.
(c) The cart's speed increases to a constant value greater than the original.
(d) The cart moves with a continually increasing speed.

12. One game at the amusement park has you push a puck up a long, frictionless ramp. You win a stuffed animal if the puck, at its highest point comes to within 10 cm of the end of the ramp, without going off. You give the puck a push, releasing it with a speed of +5.0 m/s when it is 8.5 m from the end of the ramp. The puck's speed after traveling +3.0 m is +4.0 m/s. What is the acceleration of the puck as it goes up the ramp?

(a) 0.16 $m/s^2$
(b) -6.8 $m/s^2$
(c) 9.8 $m/s^2$
(d) -1.5 $m/s^2$

# 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.

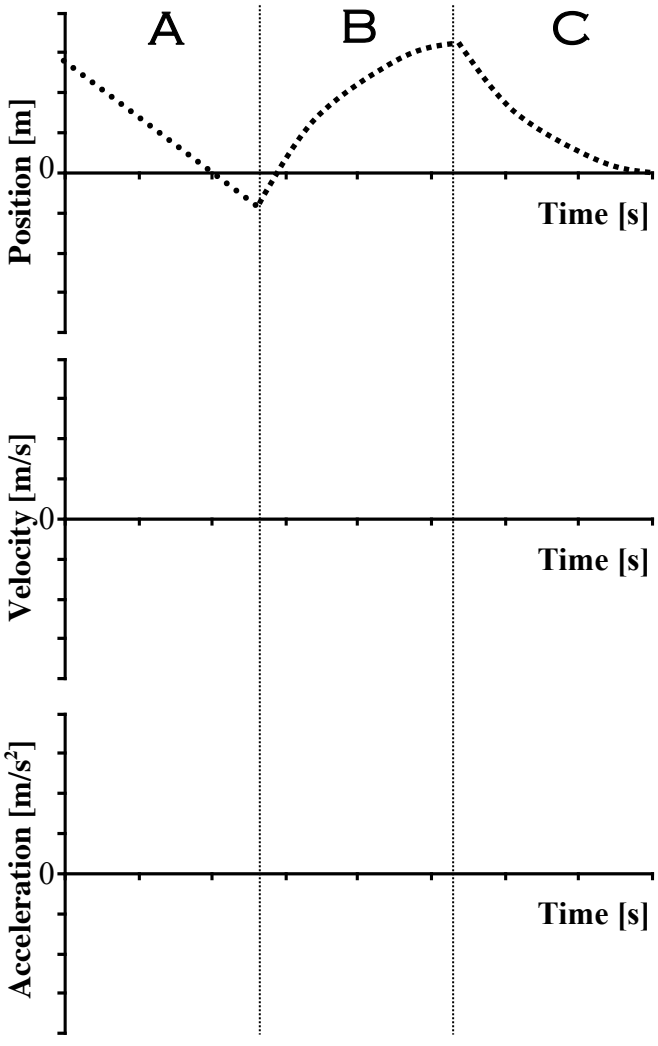
**Question 1.** **Grade this problem? Yes or No (circle one)**

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.

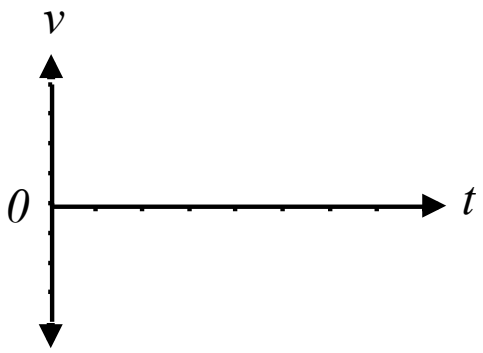



(c) In each section (A-C) describe the motion.
(x, v and a)

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

A student standing on the ground throws a 0.50 kg ball straight up. The ball leaves the student's hand with a speed of 15 m/s when the hand is 2.0 m above the ground. The student moves her hand out of the way, and the ball strikes the ground.

(a) Sketch a velocity vs time plot that could represent the motion of the ball during its motion. Please explain the shape & meaning of the graph.




(b) What is the velocity (mag+dir) of the ball before it hits the ground?

(c) How long is the ball in the air before it hits the ground?

(d) What is the maximum height the ball reaches before it turns around?

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

A block is launched along a flat floor and then up a ramp. As it leaves the top of the ramp, it is traveling with a speed of 10 m/s at an angle of 30º above the horizontal or in component form ($v_x$ = 8.7 m/s, $v_y$ =5.0 m/s). Ignore friction.

(a) Draw a full motion diagram for the motion of the block as it travels along the floor and up the ramp. Be sure to clearly label the start and end of the motion in question. Ignore the acceleration during the transition from the floor to the ramp.

(b) If it took 2.0 seconds to reach the top of the ramp, what was the initial velocity of the block?

The block now leaves the ramp and exhibits beautiful projectile motion.

(c) If it takes 3.0 seconds to hit the ground, how high was the ramp?

(d) What were the final components of the velocity right before it hit the ground?

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

In week 3 lab you launched a small plastic ball horizontally from a spring launcher. It traveled 5.0 m horizontally across the room, before landing on the floor, 0.50 seconds after the launch. Ignore air resistance.

(a) With what velocity did the ball leave the spring launcher?

(b) If the ball is accelerated from rest in the gun over a displacement of 5.0 cm, what is the average acceleration (assumed to be constant) experienced by the ball during the launch?

(c) How long did it take to accelerate the ball from rest to the velocity found in (a)? In other words, how long did the launch take?

(d) If you were to adjust the launcher, so it now doubled the horizontal velocity of the ball as it leaves the spring launcher, how long would it take the ball to hit the floor after it was launched? Words are necessary in your justification/answer.