General Physics
Physics 101
Test #1 – Fall 2016
Friday 9/23/16
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:_____

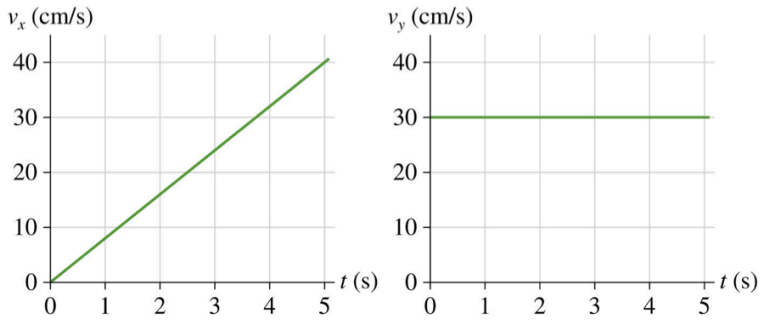
Part I. Multiple Choice (3 pts each)

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 graphs, show the movement of a rocket powered hockey puck that starts from the origin. What are the x & y coordinates of the displacement after 5.0 seconds?

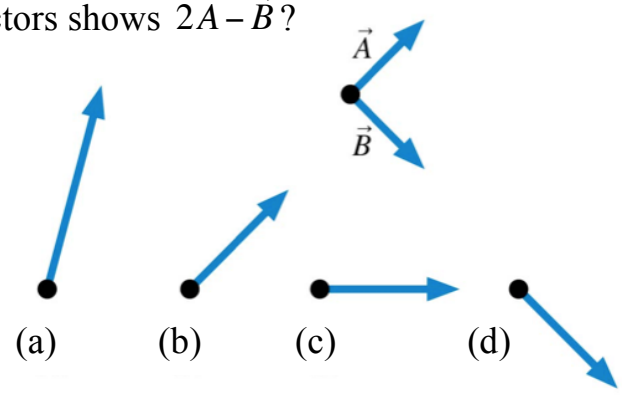


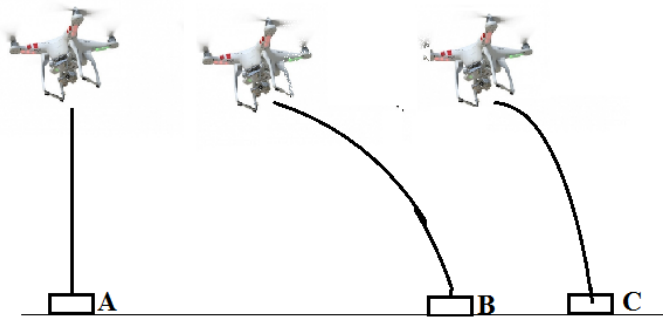
(a) (40 cm, 30 cm)
(b) $(100\hat{i} + 150\hat{j})$
(c) (2.0 x 10^2 cm, 1.5 x 10^2 cm)
(d) y =1.5m, x=1.0 m

2. Nicole throws a ball straight-up. Chad watches the ball from a window 5.0 m above the point where Nicole released it. The ball passes Chad on the way up, and has a speed of 10 m/s as it passes him on the way back down. How fast did Nicole throw the ball?

(a) 14 m/s
(b) 10 m/s
(c) 12 m/s
(d) 1.4 m/s^2

3. Which of the vectors shows $2\vec{A} - \vec{B}$?





4. Three delivery drones "drop" packages to their waiting customers from the same height. They follow the paths shown. Which of the following statements is false?

(a) All packages arrive at the same time.
(b) All packages arrive with the same velocity.
(c) Package B had the greatest horizontal velocity just before landing.
(d) All packages had the same vertical velocity just before landing.

5. You calculate a volume in lab that is 10 in^3.
What is the SI equivalent value of this volume?

(a) 163.9 cm^3
(b) 6.1 x 10^4 m^3
(c) 0.25 m^3
(d) 1.6 x 10^{-4} m^3

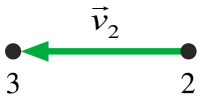
6. A hovercraft travels along on a level surface at 10.0 km/hr. How far does it travel, if it experiences an acceleration of 1.00 m/s^2 for 10.0 seconds?

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

7. The components of a velocity vector are given as v_x = -3.0 m/s and v_y=4.0 m/s
Which of the following shows the correct magnitude and angle for the velocity?

(a) 5.0 m/s, 37º counter-clockwise from the +y-axis
(b) (5.0 m/s, -53º)
(c) 5.0 m/s, 37º north of west
(d) 5.0 m/s, 53º below the x-axis

8. The figure shown shows two dots of a motion diagram and vector $\vec{v}_2$. Which of the following is a correct vector $\vec{v}_1$, if the acceleration vector points in the negative x-direction?



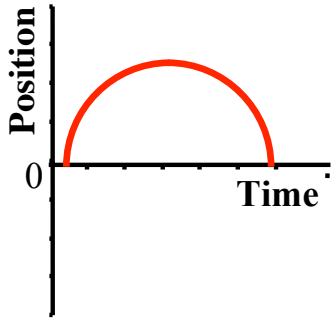
(a) $\vec{v}_1$ →

(b) $\vec{v}_1$ ←

(c) $\vec{v}_1$ ←

(d) $\vec{v}_1$ →

9. Which of the following statements about this position versus time graph is true? Assume the moving object is a rigid body and only moving in one-dimension.



(a) The object has a non-zero velocity at its maximum height.

(b) The object has a moment of zero acceleration during the motion

(c) The rise and fall time for the motion are the same.

(d) The velocity changes from positive decreasing to positive increasing.

10. On plant Afwklmn, they performed an experiment in their week 4 lab, where they analyze the motion of a "wtoor", which looks quite similar to a basketball. They fit the data for wtorr's vertical position version time graph and the equation yields...

$$y(t) = -4.5t\,\text{^}\,2 + 2.0t + 1.0$$

What is the magnitude of the acceleration due to gravity on planet Afwklmn?

(a) 2.25 m/s^2
(b) 2.0 m/s^2
(c) 4.5 m/s
(d) 9.0 m/s^2

11. A hockey puck is traveling to the left at a speed of 4.00 m/s and experiences an acceleration that causes it to move to the right at 3.00 m/s. If this occurs over 1 ms, what is the acceleration of the puck?

(a) 700 m/s^2
(b) 1.0×10^{-3} m/s^2
(c) 7 km/s^2
(d) 7.0 m/s^2

12. Bored, you throw a rock at an angle of 60 degrees above the horizontal. If the initial speed is 40 m/s and the rock impacts the ground 7.5 seconds later. Is the landing point higher or lower than the launch point?

(a) ~the same (within 1.0 m)
(b) lower
(c) higher
(d) impossible to tell

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.

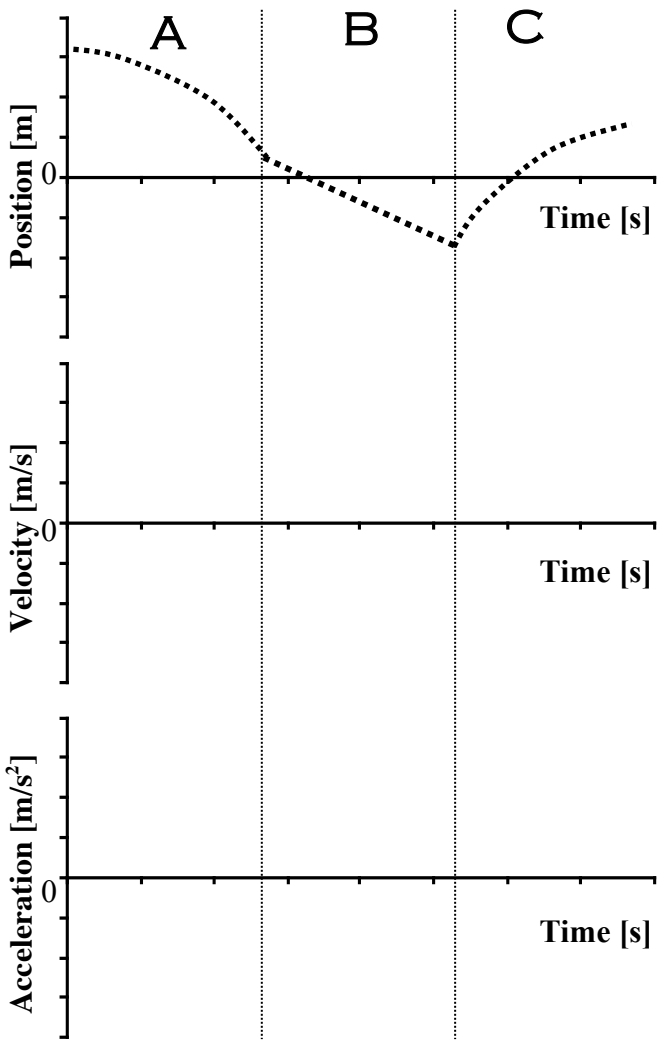
Question 1. **Grade this problem? Yes or No (circle one)**

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)**

The hallway connecting Bracy and Gallaher is a great ramp for physics (and walking without getting rained on). We have a puck with a fan that can float over most surfaces; this creates a friction-free. We'll define up the ramp as the positive direction and the ramp makes an angle of 15º with respect to the ground.

(a) You launch the puck from the bottom of the ramp with an initial velocity of 6.0 m/s. How long does it take for the puck to have a velocity of 2.0 m/s?

(b) What is the velocity of the puck after twice the time found in (a)? Explicitly state whether the puck is moving up or down the ramp.

(c) What is the displacement of the puck from the start at twice the time found in (a)?

(d) Explain how the acceleration of the puck changes as the puck moves up the ramp, turns around and slides back down. Words along with theory are necessary in your explanation.

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 full motion diagram for the motion of the car from the instant the light turn reds to when you come to rest. Be sure to clearly label the start and end of the motion in question.

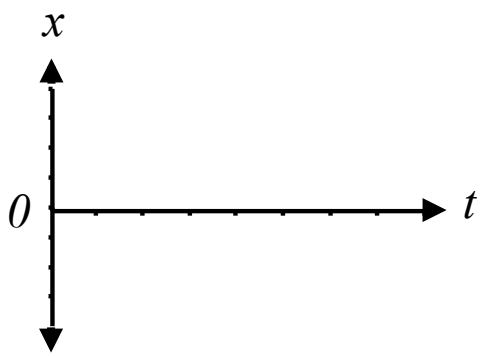
(b) How far are you from the intersection when you begin to apply the brakes?

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

(d) How long does it take you to stop after you start braking ?

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

During week 3 lab, you launched a ball from rest to a horizontal speed of 9.0 m/s moving to the right.



(a) Sketch a position vs time plot that could represent the motion of ball as it is launched (not during the flight). Please explain the shape & meaning of the graph.

(b) Post launch the ball falls a vertical distance of 1.2 m to the floor, what are the components of the impact velocity?

(c) How long did it take the ball to fall?

(d) Explain what would happen to the flight time of the ball if you increased the horizontal component of the launch velocity. Be sure to include theory and words in your justification.