

General Physics
Physics 101
Test #1 – Fall 2018
Friday 9/21/18
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)

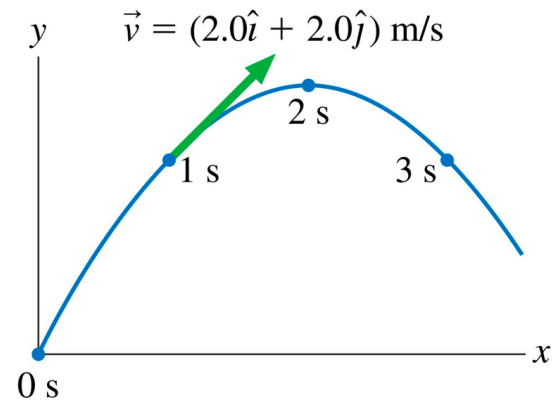
Instructions:

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 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 launch velocity?

- (a) $\vec{v} = (2.0\hat{i} + 2.8\hat{j}) \text{ m/s}$
- (b) $\vec{v} = (4.0\hat{i} + 2.0\hat{j}) \text{ m/s}$
- (c) $\vec{v} = 2.8 \text{ m/s}^2$
- (d) $\vec{v} = (2.0\hat{i} + 4.0\hat{j}) \text{ m/s}$

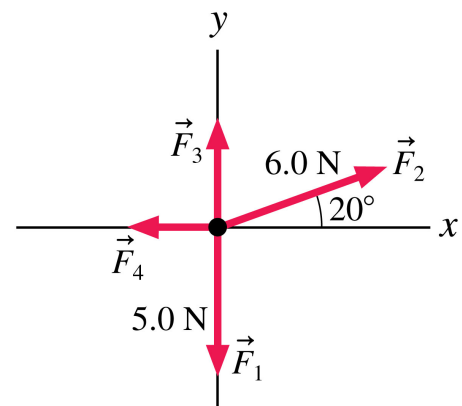


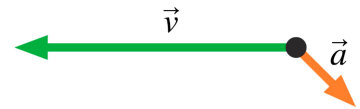
2. A spaceship is drifting in space at 10 m/s. It's rockets fire for 100 ms, causing an acceleration of -100 m/s^2 . What is the displacement of the spaceship?

- (a) -1.5 m
- (b) 0.50 m
- (c) 100 m
- (d) -4.0 m

3. Four forces in Newtons (N) are exerted on the object shown. The net force on the object is $4.0 \text{ N}\hat{i}$. What is the magnitude of F_3 ?

- (a) 1.6 N
- (b) 2.9 N
- (c) 7.0 N
- (d) Impossible to determine





4. 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.

5. A sailboat is traveling east at 5.0 m/s. A sudden gust of wind gives the boat an acceleration a (0.80 m/s^2 , 40° north of east). What is the boat's x-component of the velocity 6.0 s later when the gust subsides?

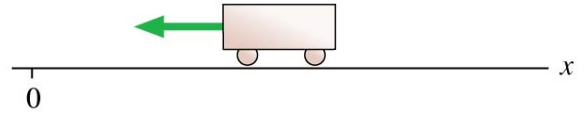
- (a) 9.8 m/s^2
- (b) 8.0 m/s
- (c) 8.7 m/s
- (d) 3.1 m/s

6. The volume of a cylinder is given as 3.34 m^3 . Express this volume in cubic inches.

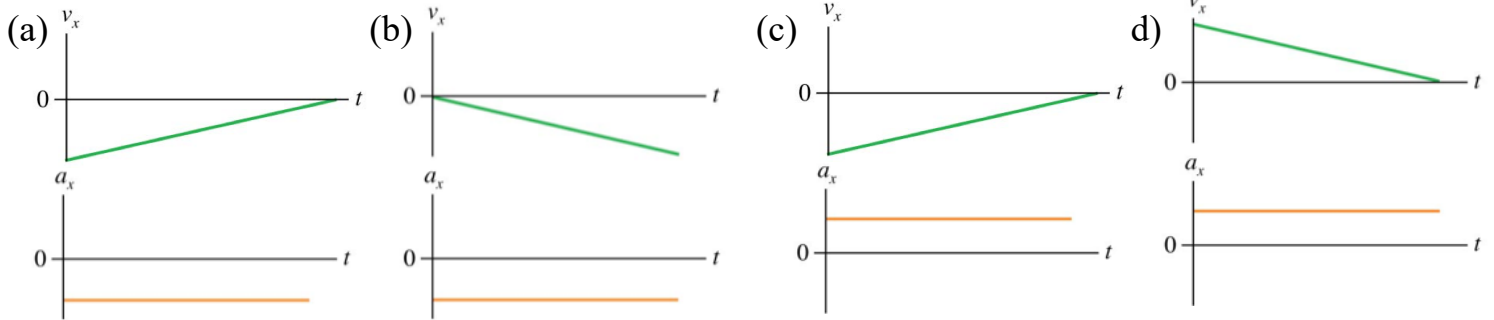
- (a) 203740 in^3
- (b) $2.04 \times 10^5 \text{ in}^3$
- (c) $5.48 \times 10^{-5} \text{ in}^3$
- (d) 131 in^3

7. A small child gives a plastic frog a big push at the bottom of a slippery 2.0 m - long, 1.0 m - high ramp, starting it with a speed of 5.0 m/s. What is the frog's speed as it flies off the top of the ramp?

- (a) 2.3 m/s
- (b) 6.7 m/s^2
- (c) 2.7 m/s
- (d) 3.8 m/s



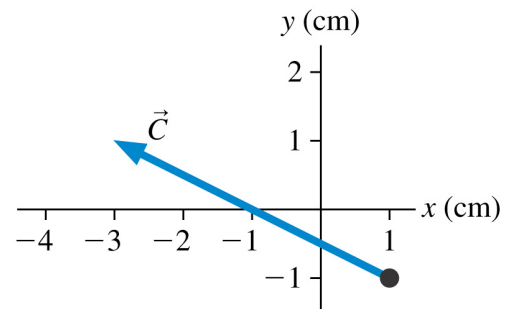
8. A cart slows down while moving toward the origin. Which shows a correct velocity and acceleration graphs?



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

10. What are the x and y components of vector C?



- (a) $-3.0\hat{i} + 1.0\hat{j}$
- (b) $C_x = 4.0 \text{ cm}, C_y = 2.0 \text{ cm}$
- (c) -3.0 cm in the x-direction, 1.0 cm in the y-direction
- (d) $(-4.0 \text{ cm}, 2.0 \text{ cm})$

11. You're 6.0 m from one wall of a house, and want to toss a ball to your friend who is 6.0 m from the opposite wall. If you throw the ball at 30 m/s at an angle of 60° above the horizontal and your friend catches the ball at the same vertical height, how long was the ball in the air?

- (a) 5.3 s
- (b) 3.1 s
- (c) 6.1 s
- (d) 2.7 s

12. Which of the following statements is not true?

- (a) At the turn around point in projectile motion the velocity can be non-zero.
- (b) The unit “mole” is an SI base unit.
- (c) It is possible to have a distance traveled with a larger displacement.
- (d) A decreasing velocity can have a positive acceleration.

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 motorcyclist traveling at 40 m/s approaches a wooden bridge over a canyon. Unfortunately, the bridge is missing due to pesky beavers chewing on the support beams. The cyclist begins braking with 20 m remaining until reaching the missing bridge but the bike is still traveling at 5.0 m/s when it reaches the missing bridge.

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

(b) What is the acceleration of the bike as it brakes?

(c) The motorcyclist grabs a well-placed rope which allows her to swing to safety. The motorcycle leaves the bridge traveling horizontally at 5.0 m/s and free-falls to the ground below. If it hits the canyon floor traveling with velocity of 20.6 m/s, 76° below the horizontal (5.0 m/s, -20.0 m/s) how long did it take the motorcycle to fall?

(d) How far did the motorcycle travel horizontally after leaving the bridge?

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?

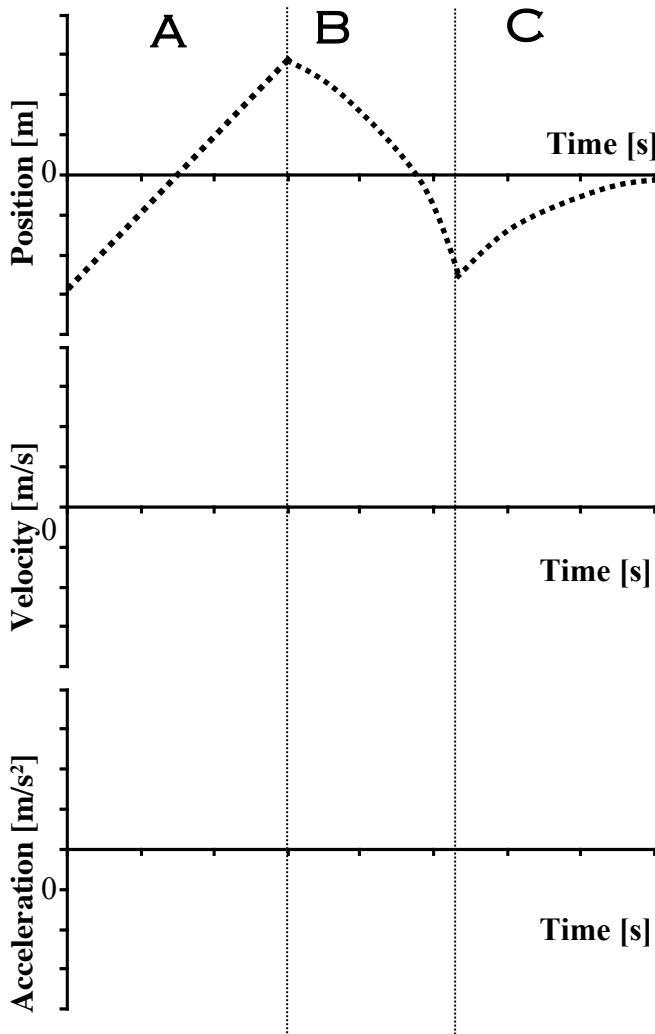
(b) Sketch the acceleration versus time.

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)

A student standing on the ground throws a ball straight up. The ball leaves the student's hand with a speed of 15.0 m/s when the hand is above the ground. The student moves her hand out of the way after release.

(a) How high does the ball travel in the air from its release point?

(b) If the ball reaches the ground 3.18 seconds after release, from what height above the ground was the ball released?

(c) What is the velocity of the ball when it impacts the ground?

(d) The student throws the ball with the same speed released at the same point, but now at an angle which gives the ball a horizontal and vertical velocity. Is the flight time of the ball, greater, less than or the same as what was stated in (b)?

No calculations are necessary, but words and theory are required.

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

The takeoff speed for an Airbus A320 jetliner is 80 m/s.

Velocity data measured during takeoff are as shown.

$t(\text{s})$	$v_x(\text{m/s})$
0	0
10	23
20	46
30	69

(a) What is the acceleration of the jetliner during take-off?

(b) At what time do the wheels leave the ground?

(c) How far did the jetliner travel during take-off?

(d) Sketch the position vs time graph for the entire motion of the jetliner prior to take-off. Please explain the shape & meaning of the graph.

