

General Physics
Physics 101
Test #1 – Spring 2019
Friday 2/15/19
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: _____

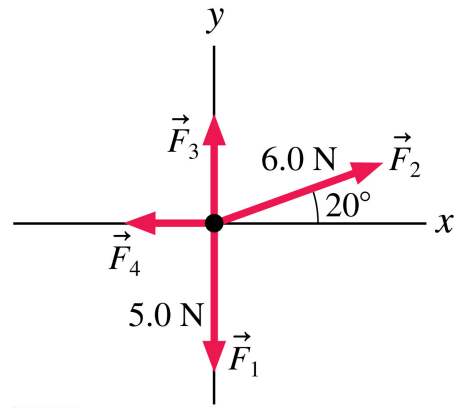
Part I. Multiple Choice (3 pts each)

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. 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_4 ?

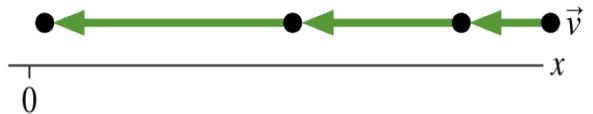


- (a) 1.6 N
- (b) 2.9 N
- (c) 2.1 N
- (d) 9.6 N

2. A ball is thrown toward a cliff of height h with a speed of 30 m/s and an angle of 60° above the horizontal. It lands on the edge of the cliff 4.0 s later. How high is the cliff?

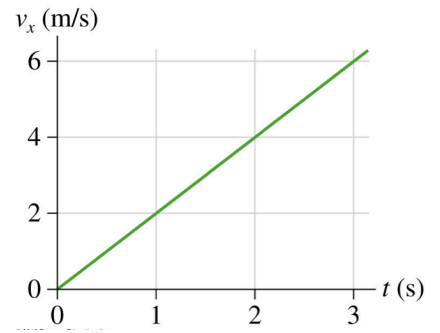
- (a) 182.3 m
- (b) 26 m
- (c) 42 m
- (d) 34 m

3. For the following motion diagram, what is true?



- (a) Acceleration is positive, velocity is negative
- (b) Velocity is increasing, position is negative
- (c) Acceleration is negative, velocity is increasing
- (d) Position is positive, acceleration is positive

4. The following velocity versus time graph shows a particle moving along the x-axis. Its initial position is $x_0 = 2.0$ m at $t_0 = 0.0$ s. At $t = 2.0$ s, what is the particle's position?



- (a) 10.0 m
- (b) 6.0 m
- (c) 4.0 m
- (d) 11.0 m

5. Your rocket sled is sliding backwards on a frozen lake with a velocity of -10 m/s, so you fire the rocket and you accelerate at 2.0 m/s². After 10 seconds, what is the total displacement of the sled?

- (a) 0.0 m
- (b) 90 m
- (c) 2.0×10^2 m
- (d) 200.0 m

6. Which of the following statements is not false?

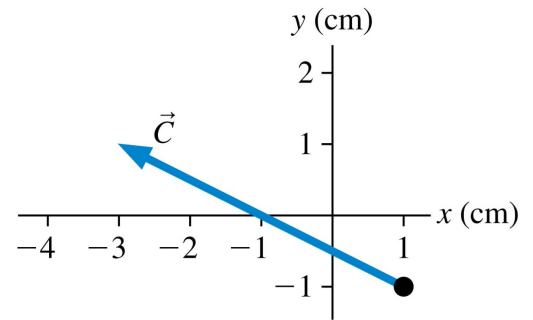
- (a) You can have a displacement without traveling a distance.
- (b) It is possible to add two vectors of unequal magnitudes together.
- (c) At the turn-around point in projectile motion, the velocity is always zero.
- (d) The unit “Ampere” is an SI base unit.

7. Samuel J. drops a box of snakes from a plane that is traveling horizontally at 115 m/s. What is the magnitude of the velocity after falling for 7.00 seconds? Ignore air resistance.

- (a) 134 m/s
- (b) 92.3 m/s
- (c) 1.84×10^2 m/s
- (d) 68.6 m/s²

8. What angle represents vector \vec{C} ?

- (a) 18° North of West
- (b) 27° above the negative x-axis
- (c) 30° clockwise from the negative x-axis
- (d) 71° West of North



9. Ball A is released from rest 2.0 m above a flat, horizontal surface. At exactly the same instant, Ball B with the same mass is fired horizontally at 3.0 m/s also from 2.0 m. Which ball hits the ground first?

- (a) A
- (b) B
- (c) both at the same time
- (d) impossible to determine with the information given

10. A student derives an equation of the form $\frac{v^2}{a}$.

What are the combined SI base units for this equation?

- (a) $\frac{m^3}{s^4}$
- (b) $\frac{1}{ms}$
- (c) m
- (d) s

11. Standing on the 2nd floor balcony of Bracy you throw (not drop) a physics text book straight down with an initial velocity of -10 m/s. What is the velocity of the book immediately before it strikes the ground 4.0 m below?

- (a) 13.36 m/s
- (b) 4.7 m/s
- (c) -8.3 m/s
- (d) -13 m/s

12. A student pushes a sled from rest across a level icy lake with a small constant acceleration. The frictionless ice allows the sled to slide freely and the student has really good spikes on their boots, so they have grip. If the student stops the sled and pushes it from rest with double the original acceleration, what is a correct description of the sled's subsequent motion?

- (a) The sled's speed increases at the same rate in either situation.
- (b) The sled's speed is the same in either situation.
- (c) The sled achieves a constant speed bigger than the original speed.
- (d) The sled moves with a continually increasing speed.

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)**

You're 6.0 m from one wall of a house, and want to toss a 50 g ball to your friend who is 6.0 m from the opposite wall. You throw the ball at 15 m/s at an angle of 60° above the horizontal ($v_x=7.5$ m/s, $v_y=13$ m/s) and your friend catches the ball at the same vertical height.

(a) What is the maximum vertical displacement achieved by the ball from launch?

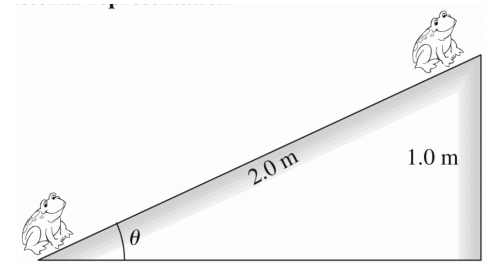
(b) At the ball's maximum height, explain whether the value of velocity AND acceleration are (+, 0 or -). Be sure to justify each with theory and words as needed. No calculations are required.

(c) How long was the ball in the air?

(d) What is the horizontal distance between you and your friend?

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

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. The frog flies off the top of the ramp.



(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 frog as it moves up the ramp?
Be sure to state the direction of the acceleration in terms of the ramp.

(c) What is the frog's speed as it flies off the top of the ramp?

(d) How long did it take the frog to reach the top of the ramp?

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

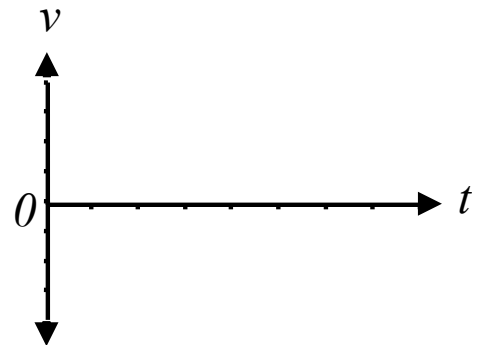
A cat is sleeping on the floor in the middle of a 3.6-m-wide room when a barking dog enters with a speed of 1.50 m/s. As the dog enters, the cat (as only cats can do) immediately accelerates at 0.85 m/s^2 toward an open window on the opposite side of the room. The dog (all bark and no bite) is a bit startled by the cat and begins to slow down at 0.10 m/s^2 as soon as it enters the room.

(a) How long did it take the cat to get to the window?

(b) With the time found in (a) determine the location of the dog with respect to the door when the cat arrives at the window.

(c) How fast is the dog traveling when he reaches the window?

(d) Sketch the velocity vs time graph for the entire motion of the dog. Please explain the shape & meaning of the graph.



Question 4. **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?

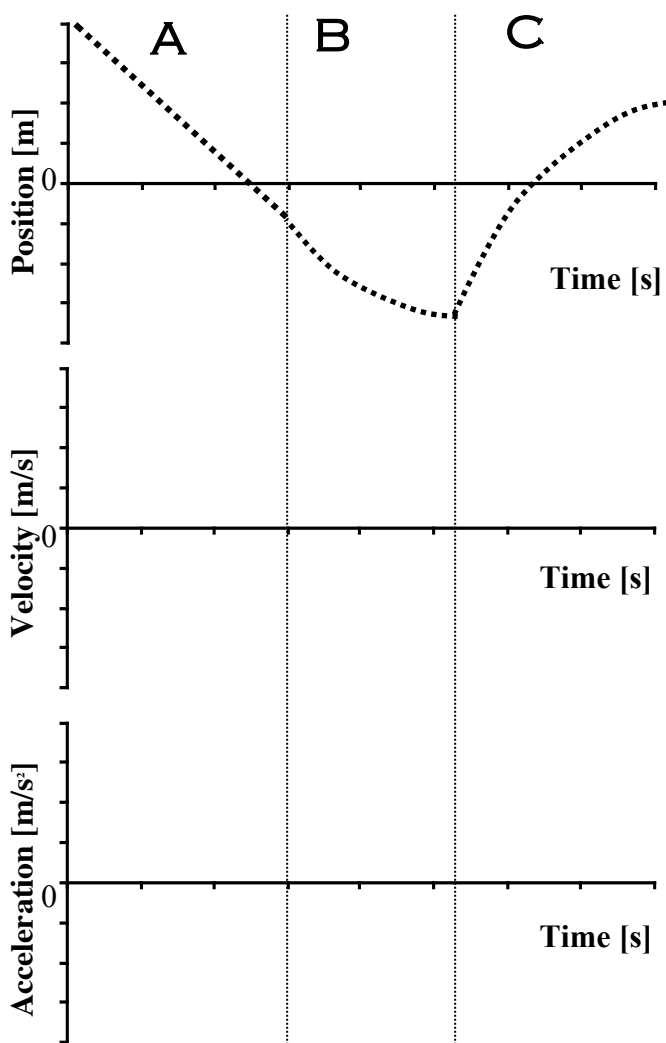
(b) Sketch the acceleration versus time.

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)