

General Physics
Physics 101
Test #1 – Fall 2015
Friday 10/2/15
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:

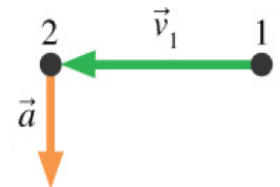
Please clearly circle one and only one answer for each of the following.
Show all of your work. Partial credit may be given if you include your work.

Questions:

1. A rocket ship in deep space is traveling at -10 m/s and is caught in a tractor beam which causes the ship to slow. If the ship has a displacement of $+10$ m after 1.0 minute, what is the acceleration of the ship?

- (a) 40 m/s
- (b) 0.67 m/s²
- (c) -0.33 m/s²
- (d) 0.34 m/s²

2. A particle undergoes the acceleration shown, while moving from point 1 to point 2. Which of the following statements is false about the subsequent motion of the particle.

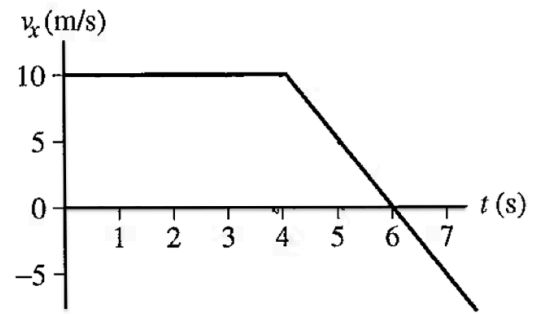


- (a) The particle curves downward.
- (b) The particle's velocity is constant.
- (c) The particle is moving to the southwest
- (d) It is possible the particle could follow a circular path

3. 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. The throw and catch occur 1.0 m above the ground and the peak of the roof is 6.0 m from the ground. What is the minimum vertical velocity that will allow the ball to clear the roof?

- (a) 9.9 m/s
- (b) 11 m/s
- (c) 1.1 m/s
- (d) need more information

4. For the following velocity versus time graph, find the object's position at 6.0 seconds. Assume the initial start position of the object is 20 m.

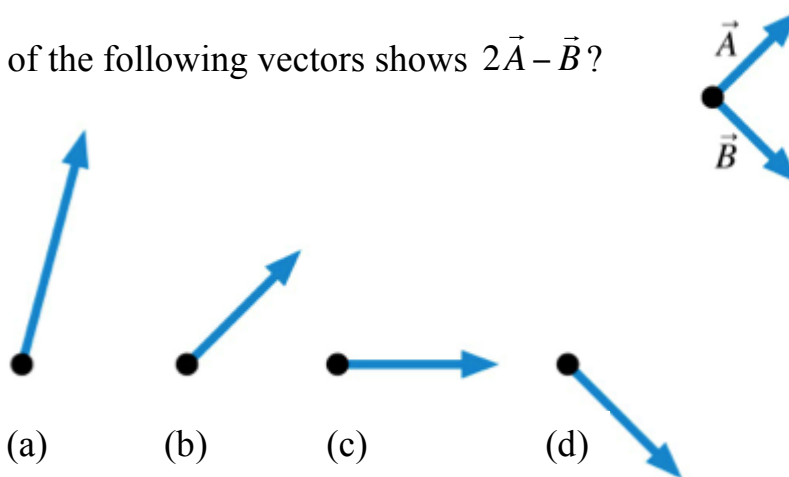


- (a) 40 m
- (b) 50 m
- (c) 60 m
- (d) 70 m

5. Which of the following statements is true?

- (a) A negative acceleration always causes a velocity to decrease.
- (b) In projectile motion, the velocity is never non-zero at the maximum height.
- (c) The unit “Kelvin” is an SI base unit.
- (d) Vectors of non-equal magnitude can add to zero.

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



7. 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
- (b) 8.0 m/s
- (c) 8.7 m/s
- (d) 3.1 m/s

8. An ice-cube slides from rest down a 30° ramp. If it takes 300 ms for it to slide, how long is the ramp?

- (a) 0.22 m
- (b) 44 cm
- (c) 74 cm
- (d) $3.0 \times 10^2 \text{ m}$

9. The equation for the Ultimate Question of Life, the Universe, and Everything provides the answer of 42 and has the form shown. $\frac{1}{v} \left(\frac{a}{t^2} \right) = 42 \text{ [units?]}$
 What are the combined SI base units for this equation?

- (a) $\frac{m^2}{s^5}$
- (b) $\frac{1}{s^5}$
- (c) s^{-3}
- (d) $m^2 s^{-3}$

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



- (a) Position changes signs
- (b) Acceleration is negative
- (c) Velocity is negative
- (d) Velocity is decreasing

11. A golf ball on the moon ($g_{\text{moon}} = \frac{1}{6} g_{\text{earth}}$), is hit with an initial velocity of 100 m/s at an angle of 45.0° ($v_{ix} = v_{iy} = 70.7$ m/s). Assuming the launch and landing altitude are the same, what is the flight time of the ball?

- (a) 14.4 s
- (b) 122 s
- (c) 43.3 s
- (d) 86.6 s

12. A 10 kg ball is thrown vertically upwards from a cliff at a velocity of 10 m/s, it lands on the ground below the cliff 10 seconds later. What was the impact velocity of the ball?

- (a) 108.0 m/s
- (b) -88 m/s
- (c) 1.0×10^2 m/s
- (d) -0.11 km/s

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?

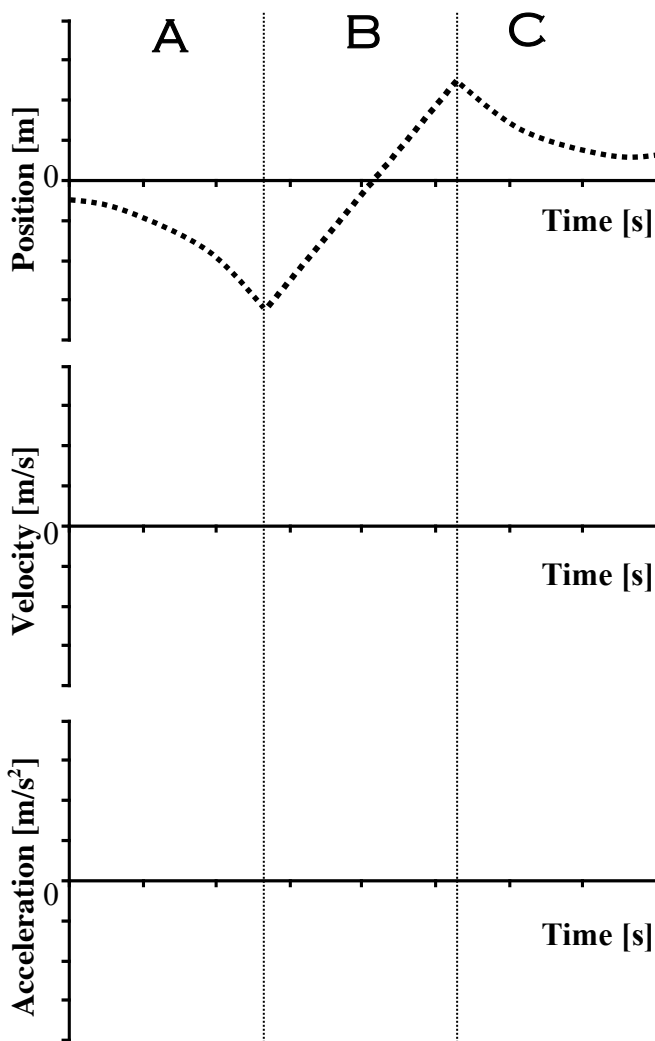
(b) Sketch the acceleration versus time.

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 rock is thrown toward a cliff of height h with an initial speed of 30.0 m/s and an angle of 60.0° above the horizontal. It lands on the cliff 4.00 s later.

(a) Calculate the rock's initial velocity and write the answer in \hat{i} & \hat{j} notation.

(b) What was the maximum height of the rock?

(c) How high is the cliff?

(d) Explain what would happen to the flight time of the rock if you increased the horizontal component of the launch velocity. Be sure to include theory and words in your justification. Also assume the rock still lands on the cliff at the same height.

Question 3.

Grade this problem? Yes or No (circle one)

You're driving down the highway late one night at 20 m/s when a deer steps onto the road in front of you. Your reaction time before stepping on the brakes is 0.50 s, and the maximum acceleration of your car is -10 m/s^2 as it comes to a stop.

(a) Draw a complete motion diagram for the car from the moment you saw the deer until the car stops. Be sure to denote the point where braking starts.

(b) How far did the car travel before you were able to react and apply the brakes?

(c) What is the displacement of the car during the braking?

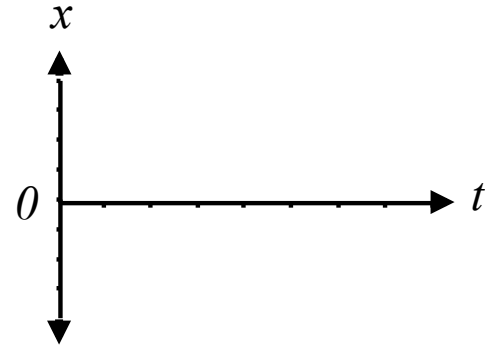
(d) If the deer was 35m from your car at the moment you saw it, did you hit the deer? Be sure to provide a numerical answer for the distance between you and the deer and words/equations/theory to help justify your answer.

Question 4.

Grade this problem? Yes or No (circle one)

During week 3 lab, you launched a ball horizontally at a 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. Please explain the shape & meaning of the graph.



(b) If the barrel is 8.0 cm in length, what is the acceleration of the ball as it is launched out of the launcher? Please assume the acceleration is constant.

(c) How long did the launch take?

(d) Post launch the ball flew across the lab landing on the floor. If the ball falls a vertical distance of 1.3 m, how long did it take to hit the ground after leaving the launcher?