

General Physics
Physics 101
Test #1 – Fall 2011
Friday 9/30/11
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 cart that is rolling at a constant velocity on a level table fires a ball straight up. Where does the ball land?

- (a) Ahead of the launching tube
- (b) Behind the launching tube
- (c) In the launching tube
- (d) Impossible to determine

2. A rocket in deep space (no gravity), starting from rest fires its rockets for 1.0 min. If the final velocity of the rocket is -99 m/s, what is the acceleration of the rocket?

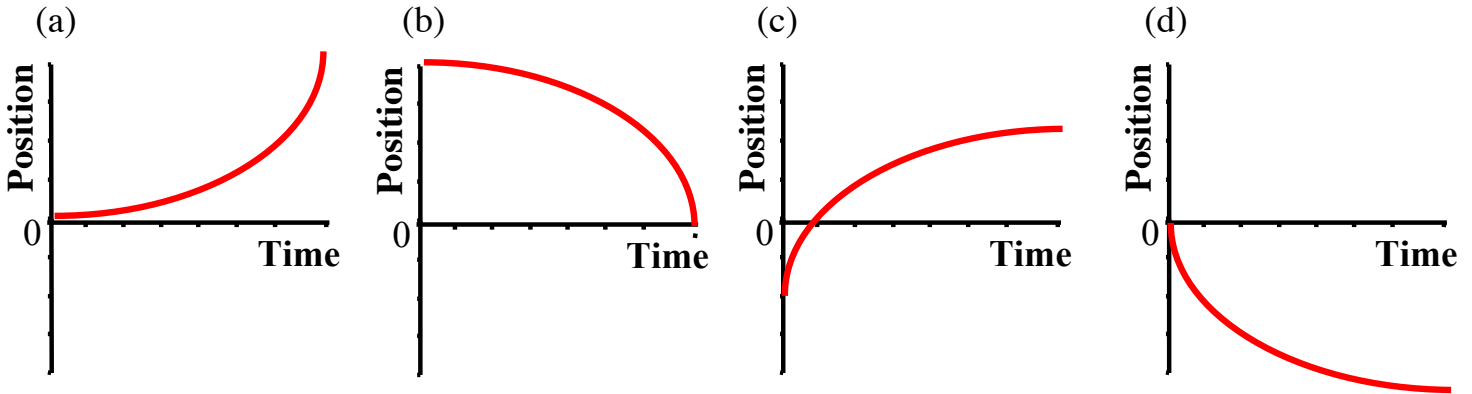
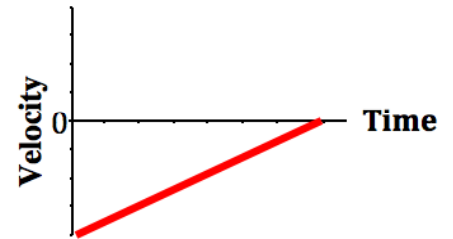
- (a) -99 m/s²
- (b) 1.650 m/s²
- (c) 81 m/s²
- (d) -1.7 m/s²

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

What are the combined SI base units for this equation?

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

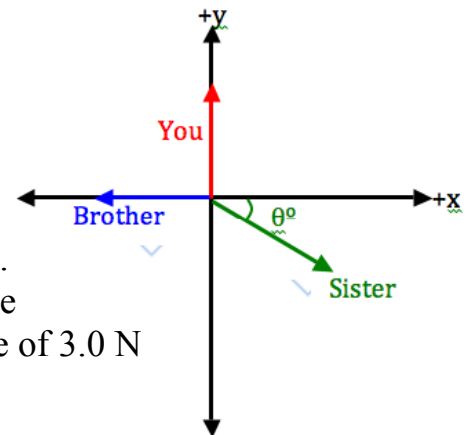
4. Which of the following position versus time graphs could represent the velocity vs time graph shown.



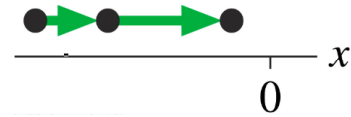
5. A block slides off a flat table with a horizontal velocity of 1.0 m/s. If the final vertical velocity is -4.0 m/s, what is the height of the table?

- (a) 0.41 m
- (b) 0.82 m
- (c) 0.051 m
- (d) 0.86 m

6. You and two siblings are having a tug of war over a t-shirt. Each person is pulling with the proper amount of force to have the net (total) force on the shirt is zero. You pull with a force of 3.0 N and your brother pulls with 2.0 N, as shown. What angle does your sister have to pull with?



- (a) 33° south of east
- (b) 56° south of east
- (c) 3.7° south of east
- (d) 45° south of east



7. Which of the following are false for the motion diagram shown?

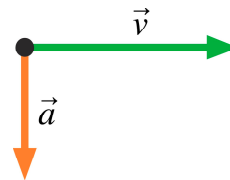
- I. The object has positive acceleration
- II. The object has negative velocity
- III. The object is moving away from the origin

- (a) I, II and III
- (b) II and III
- (c) I only
- (d) I and II

8. On the Apollo 15 mission to the moon, astronaut Alan Shepard hit a golf ball with a 6 iron. The free-fall acceleration on the moon is $1/6$ of its value on earth. Suppose he hit the ball with a speed of 25.0 m/s at an angle of 30.0° above the horizontal. Assuming the hit is on a large flat surface, how long was the ball in the air?

- (a) 15.3 s
- (b) 2.55 s
- (c) 7.65 s
- (d) 30.6 s

9. The particle shown follows a...



- (a) Parabolic trajectory
- (b) Straight-line trajectory
- (c) Circular trajectory
- (d) Not possible to tell

10. A 5.00 kg block is traveling up a frictionless ramp with an angle of 20.0° with an initial speed of 10.0 m/s . What is the velocity of the block after 5.00 seconds?

- (a) 26.8 m
- (b) -16.8 m/s
- (c) -6.8 m/s
- (d) 39 m/s

11. Walking home a bear is secretly hiding in the bushes 10 m away from your door waiting to say “hello”. You are almost to the door, when the bear (starting from rest) accelerates towards you at 0.14 m/s^2 . If it takes you 10 s to make it inside your home from when the bear started, do you make it inside?

- (a) Yes, with more than a second to spare.
- (b) No, the bear is quicker than you by more than a second.
- (c) Too close to call, the times are less than a second different.
- (d) Not enough information given

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

I. Running north for 10 m

II. Walking west for 20 m

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

- (a) $(0\hat{i} + 0\hat{j})m$
- (b) $(30\hat{i} + 30\hat{j})m$
- (c) $(-10\hat{i} + 30\hat{j})m$
- (d) $(20\hat{i} + 0\hat{j})m$

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)

There's a game* I've heard that people play where a small ball is tossed towards a cup sitting on a table, 1.0 m above the floor. A winner is you, if you get the ball in the cup. You throw the ball from a distance of 0.50 m above the table with an initial velocity of 4.0 m/s horizontally and 1.0 m/s vertically. **I am referencing the game Cuponk™.*

(a) If the cup is a horizontal distance of 3.0 m away from where you release the ball, how long should it take for the ball to reach the cup?

(b) What is the magnitude and direction of the vertical velocity of the ball when it lands in the cup? Assume that this occurs at the height of the table.

(c) What is the maximum vertical height above the table the ball attains in its flight?

(d) At the instance the ball reaches the maximum vertical height, what is the magnitude and direction of the acceleration on the ball? Words are necessary to explain your answer. No further calculations are necessary.

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?

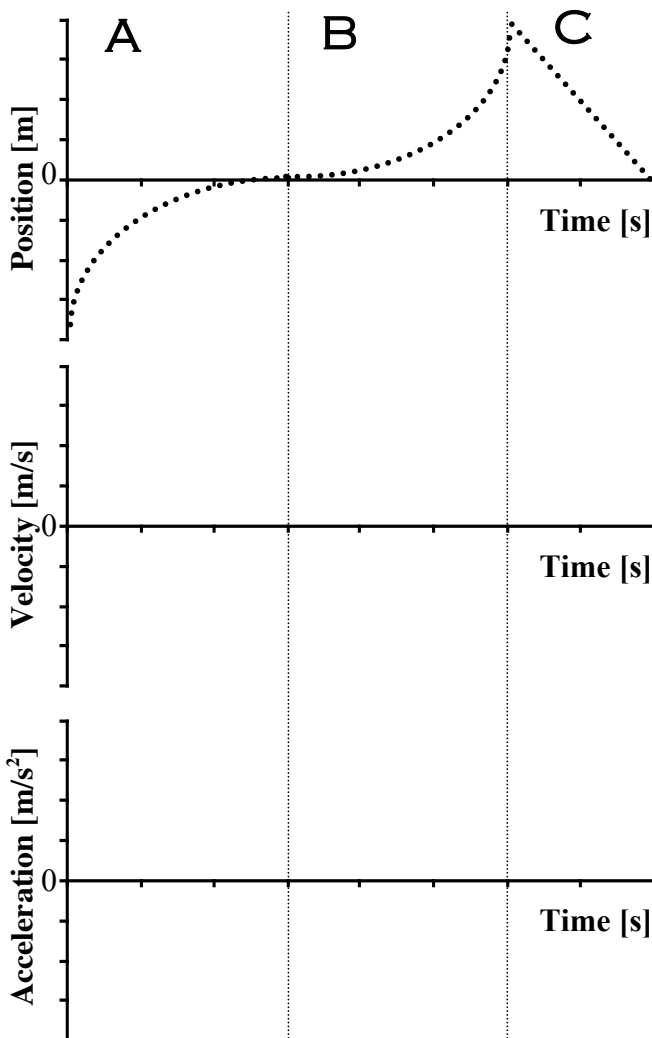
(b) Sketch the acceleration versus time.

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 jet plane is cruising at 300 m/s when suddenly the pilot turns the engines up to full throttle achieving a uniform acceleration. After traveling a 4.0 km straight-line displacement, the jet is moving with a speed of 400 m/s.

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

(b) What is the acceleration if the jet?

(c) How long does this acceleration occur?

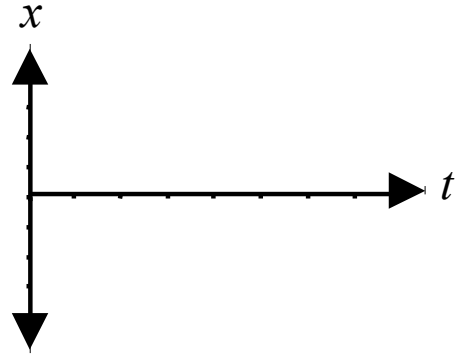
(d) If the jet flew in a non straight-line during this motion (say it flew in a circle), would the average velocity be the same, greater or less than the average speed for the non straight-line motion?

Question 4.

Grade this problem? Yes or No (circle one)

A child on a scooter is traveling to the left at a speed of 4.0 m/s and experiences an acceleration in the opposite direction of the motion.

- (a) Sketch a position vs time plot that could represent the motion of the child on the scooter. Please explain the shape & meaning of the graph.



- (b) If at 1.0 second the velocity of the child is -2.0 m/s, what is his acceleration?

- (c) What is the displacement of the child after 2.0 seconds?

- (d) What is the magnitude and direction of the velocity after 2.0 s?