General Physics
Physics 101
Test #1 – Fall 2020
Friday 9/25/20
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:

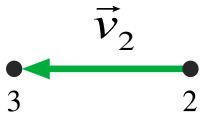
Please clearly circle one and only one answer for each of the following.
Show all of your work. Partial credit may be given if you include your work.

Questions:

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

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

2. 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 to the left?



(a) $\vec{v}_1$ →

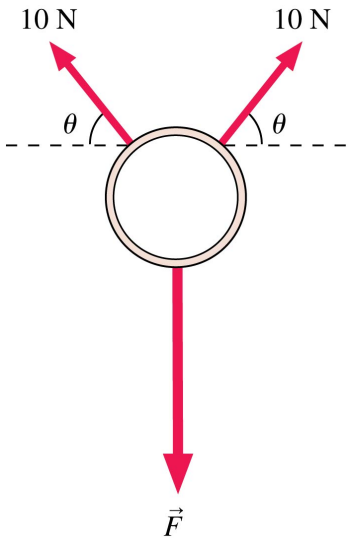
(c) $\vec{v}_1$ ←

(b) $\vec{v}_1$ ←

(d) $\vec{v}_1$ →

3. A car traveling at 42 m/s brakes for 2.1 second. If it traveled 23 m during this braking, what was the magnitude of the car's acceleraiton?

(a) 29.57 m/s
(b) 9.6 m/s^2
(c) 50 m/s^2
(d) 30 m/s^2



4. A mass-less ring, seen from above, is pulled on by three forces with theta equal to 30º. The ring has a net force of zero. How big is the force *F*?

(a) 10 N
(b) 17 N
(c) 8.7 N
(d) 20 N

5. The volume of a sphere is calculated as 1 in^3. What is the volume in cm^3?

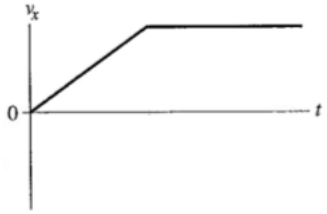
(a) 0.394 cm^3
(b) 0.06 cm^3
(c) 16.4 cm^3
(d) 2 x 10^1 cm^3

6. A ball is thrown toward a cliff of height h with a speed of 30 m/s and an angle of 60º above the horizontal. It lands on the edge of the cliff 4.0 s later. What is the max vertical height of the ball?

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

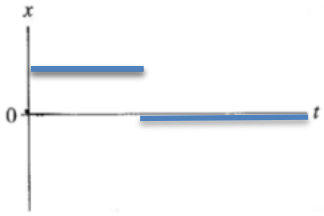
7. Which of the following statements is false…

(a) It is possible travel a larger distance with a smaller displacement.
(b) The unit "Candela" is an SI base unit.
(c) In projectile motion the velocity is always zero at the turn around point.
(d) A vector can have a non-zero mag. & have one component be zero.

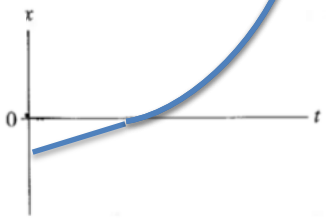


8. For the following velocity versus time graph, which could represent the corresponding position versus time graph.

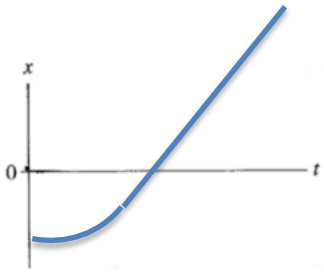
(a)



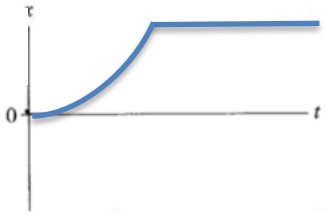
(b)



(c)



(d)



9. On plant YEET, they performed an experiment in week 4 lab, where they analyze the motion of a "Kobe", which looks quite similar to a basketball (RIP). They fit the data for Kobe's vertical position versus time graph and the equation yields...

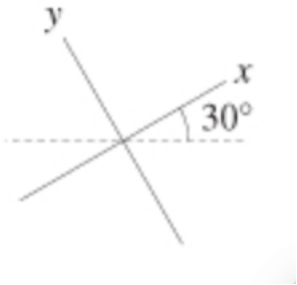
$$y(t) = -4.2t \text{ ^ } 2 + 3.0t + 2.0$$

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

(a) 8.4 m/s^2
(b) 4.2 m/s
(c) 3.0 m/s^2
(d) 2.1 m/s^2

10. A car traveling at +30.0 m/s runs out of gas while traveling up a 20º slope. After 10 seconds, what is the car's velocity?

(a) -3.5 m/s
(b) -33 m/s
(c) 0.0 m/s
(d) 63 m/s



11. Let B = (9.0 m, 70º counterclockwise from the vertical upward direction), what are the x and y components of B in the coordinate system shown? Note: upward is up the page.

(a) (-8.5, +3.1)
(b) (-5.8 m, 6.9 m)
(c) (-3.1, 8.5) m
(d) 6.9 m in the negative x and 5.8 m in the positive y

12. A dog sled is pulled from rest across a level bit of ice with a small constant acceleration. The sled stops and they attach more dogs to the sled, which cause it to move from rest with double the original acceleration. What is a correct description of the sled's subsequent motion? Ignore friction.

(a) The sled moves with a constant speed that is bigger than the original speed.
(b) The sled's speed increases to a constant value greater than the original.
(c) The sled's speed increases continually.
(d) The final speed of the sled is the same in either situation.

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)**

The object of table shuffle-board is to slide pucks across a table to a point near the end of the table without falling off. In order to decrease friction, the table is sprinkled liberally with shuffleboard wax. It's not quite friction free though.

(a) You launch a puck with an initial velocity of 4.0 m/s and it comes to rest after 2.0 seconds while experiencing a constant -2.0 m/s^2 acceleration. What distance did the puck travel?

You launch a second puck and it travels down the level table and flies off the table with a velocity of 1.0 m/s and it lands on the floor below after falling 1.4 m vertically
(b) What is the flight time of the puck?

(c) How far did the second puck travel horizontally from the edge of the table?

(d) If a third puck leaves the table with twice the velocity as the second puck, explain how the flight time of the third puck compares to the flight time of the second puck.

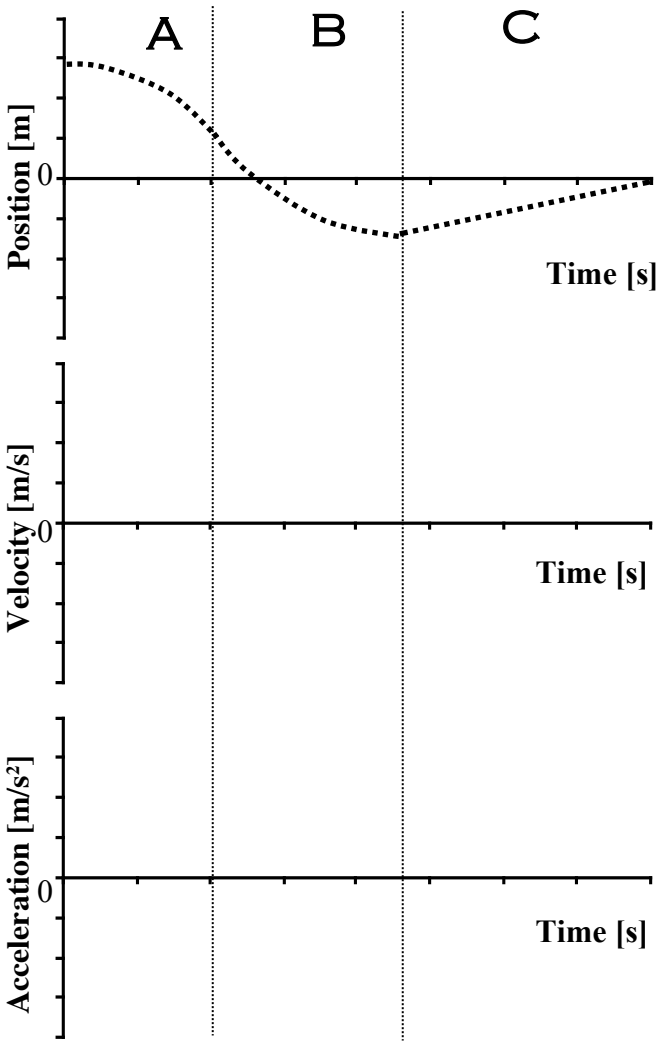
Question 2. **Grade this problem? Yes or No (circle one)**

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)

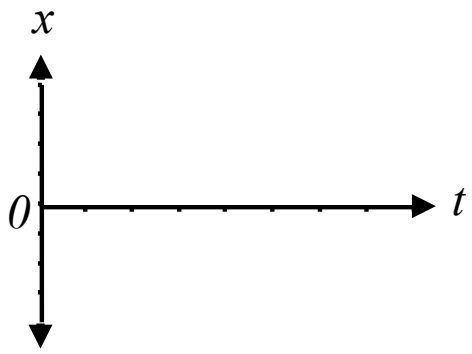
You are at a train station, as a train enters the station and begins to brake with constant acceleration. The front of the first car is traveling at 20 m/s and the end is traveling at 18 m/s once it passes you. Each train car is 25 m long.

(a) What is the acceleration of the train?

(b) How fast is the fourth car traveling when it fully passes you?

(c) How long does it take for all four cars to fully pass you?

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



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

A lead ball is dropped into a lake from a diving board 5.0 m above the water. After entering the water, it sinks to the bottom with a constant velocity equal to the velocity with which it hit the water. The ball reaches the bottom 3.0 s after it is released.

(a) Draw a full motion diagram for the motion of the ball from the instant it is released to the moment before it hits the bottom. Be sure to clearly label the start and end of the motion in question.

(b) What is the velocity of the ball right before it impacts the water?

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

(d) How deep is the lake?