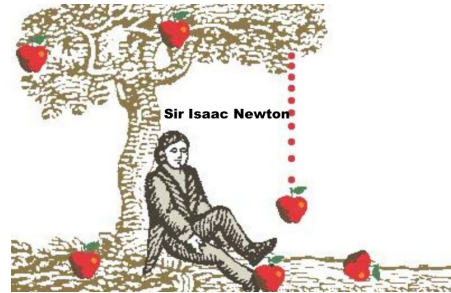


**Part 1 || Multiple Choice (20X3 =60)**

1. How far will an apple starting from rest fall freely in 2 seconds?

- a. 18.7 m
- b. 44.0 m
- c. 43.0 m
- d. 19.6 m
- e. None the above



2. A 5000 kg truck travels at a constant speed of 12 m/s around a circular curve of radius 10 meters. What is the magnitude of the centripetal acceleration of the car as it goes around the curve?

- a.  $14.7 \text{ m/s}^2$
- b.  $14.4 \text{ m/s}^2$
- c.  $14.9 \text{ m/s}^2$
- d.  $14.8 \text{ m/s}^2$
- e. None the above

3. At what angle will the horizontal & vertical components of the vector be equal in magnitude?

- a.  $90^\circ$
- b.  $80^\circ$
- c.  $600^\circ$
- d.  $45^\circ$
- e. None the above

4. A car initially traveling at a speed of 16 m/s accelerates uniformly to a speed of 20 m/s over a time of 10 seconds. What is the magnitude of the car's acceleration?

- a.  $0.5 \text{ m/s}^2$
- b.  $0.4 \text{ m/s}^2$
- c.  $0.6 \text{ m/s}^2$
- d.  $0.8 \text{ m/s}^2$
- e. None the above

5. One car travels 30 meters due east in 6 seconds, and a second car travels 25 meters due west in 5 seconds. During their periods of travel, the cars had the same:

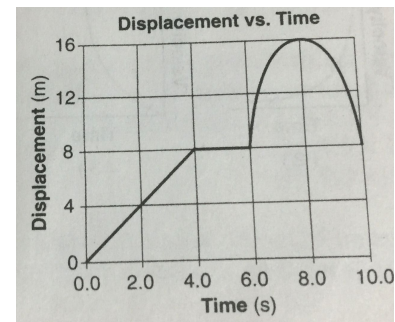
- a. Velocity
- b. Acceleration
- c. Speed
- d. Distance
- e. None the above

6. Sam kicks a ball with an initial velocity of 10 m/s at an angle of  $30^\circ$  with the horizontal and a total time of flight of 1.0 second. Find horizontal & vertical components of the ball's initial velocity. The maximum height reached by the ball is approximately?

- a. 8.7 m/s , 5 m/s and 1.25 m
- b. 8.7 m/s , 5 m/s and 4.9 m
- c. 9.7 m/s , 5 m/s and 2.25 m
- d. 8.7 m/s , 6 m/s and 3.25 m
- e. None the above

7. Use the graph to find distance and the displacement:

- a. 30 meter and 5 meter
- b. 31 meter and 40 meter
- c. 24 meter and -8 meter
- d. 23 meter and 55 meter
- e. None the above



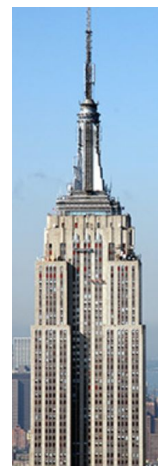
8. Mr. Bari jumped straight up to grab a rebound. If he was in the air for 0.90 seconds, how high did he jump?

- a. 0.68 m
- b. 0.78 m
- c. 0.88 m
- d. 0.99 m
- e. 0.48 m



9. Mr. Bari's Physics student Tim threw a penny horizontally at a speed of 10 m/s from the top of a Empire State Building to learn its height (Ignore air resistance). If the penny hits the ground 9.17 seconds later, find the **real** height of Empire State Building (Note: Verify the information once you get home to see whether physics works!)

- a. 401 meter
- b. 412 meter
- c. 429 meter
- d. 461 meter
- e. None the above



**10. Joseph fired a projectile with an initial velocity of 100 m/s at an unknown angle above the horizontal. If the projectile's initial horizontal speed is 50 meters per second, then find the unknown angle.**

- a. 78.56 degree
- b. 79.26 degree
- c. 78.46 degree
- d. 80.76 degree
- e. None the above

**11. An airplane traveling north at 100 m/s encounters a 10 m/s crosswind from west to east. What is the resultant velocity?**

- a. 22.36 m/s
- b. 22.12 m/s
- c. 22.07m/s
- d. 22.02 m/s
- e. None the above

**12. The components of a 30 m/s velocity at an angle of 30° above the horizontal are?**

- a. 7.5 m/s & 12.5 m/s
- b. 26 m/s & 15 m/s
- c. 8.5 m/s & 13 m/s
- d. 27 m/s & 16 m/s
- e. None the above

**13. A ball is thrown with an initial speed of 10 meters per second. At what angle above the horizontal should the ball be thrown to reach the greatest height?**

- a. 45 degree
- b. 90 degree
- c. 30 degree
- d. 95 degree
- e. None the above

**14. An airplane accelerates down a runway at 3.20 m/s<sup>2</sup> for 32.8 seconds until it finally lifts off the ground. Determine the distance traveled before takeoff.**

- a. 1723 m
- b. 1721 m
- c. 1723 m
- d. 1725 m
- e. None the above

**15. If Ben free falls for 2 seconds, what will be his final velocity and how far will he fall?**

- a. 19.2 m/s & 19.3 m
- b. 19.4 m/s & 19.5 m

- c. 19.6 m/s & 19.6 m
- d. 19.2 m/s & 19 m
- e. None the above

**16. Rocket-powered sleds are used to test the human response to acceleration. If a rocket-powered sled is accelerated to a speed of 444 m/s in 1.83 seconds, then what is the acceleration and what is the distance that the sled travels?**

- a.  $243 \text{ m/s}^2$  & 406 m
- b.  $241 \text{ m/s}^2$  & 403 m
- c.  $244 \text{ m/s}^2$  & 405 m
- d.  $248 \text{ m/s}^2$  & 407 m
- e. None the above

**17. An engineer is designing the runway for an airport. Of the planes that will use the airport, the lowest acceleration rate is likely to be  $3 \text{ m/s}^2$ . The takeoff speed for this plane will be 65 m/s. Assuming this minimum acceleration, what is the minimum allowed length for the runway?**

- a. 705 m
- b. 704 m
- c. 706 m
- d. 707 m
- e. None the above

**18. A kangaroo is capable of jumping to a height of 2.62 m. Determine the takeoff speed of the kangaroo.**

- a. 6.17 m/s
- b. 5.17 m/s
- c. 7.17 m/s
- d. 9.17 m/s
- e. None the above

**19. If Michael Jordan has a vertical leap of 1.29 m, then what is his takeoff speed and his hang time (total time to move upwards to the peak and then return to the ground)?**

- a. 5.01 m/s & 1.01 s
- b. 5.02 m/s & 1.02 s
- c. 5.03 m/s & 1.03 s
- d. 5.04 m/s & 1.05 s
- e. None the above

**20. David's car is traveling at 22.4 m/s, and skids to a stop in 2.55 s. Determine the skidding distance of his car (assume uniform acceleration).**

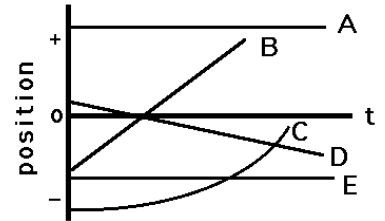
- a. 25.6 m
- b. 28.6 m
- c. 27.6 m

- d. 29.6 m
- e. None the above

**Part 2 Constructed response || (5 X 8) = 40 points**

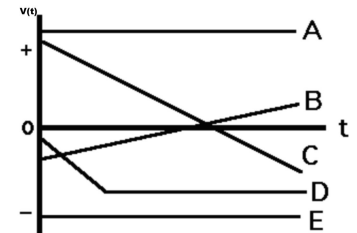
1. Use the graph below to answer following questions (I) Which object maintains constant velocity (II) Which object is accelerating (III) Which objects are not moving (IV) Which object changes direction (V) On average, which object is traveling fastest (VI) Which object has the greatest acceleration?

I	II	III	IV	V	VI



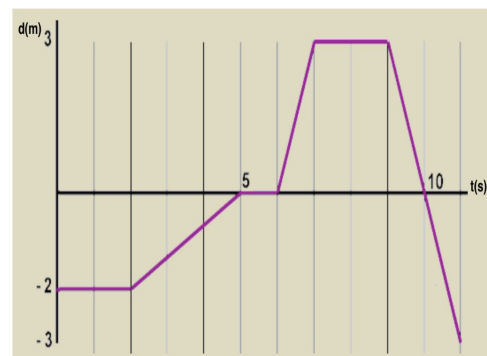
2. Which object(s) is/are maintaining its state of motion (II) Which object(s) is/are accelerating? (III) Which object(s) is/are not moving (IV) Which object(s) change(s) its direction? (V) Which accelerating object has the smallest acceleration? (VI) Which object has the greatest velocity?

I	II	III	IV	V	VI

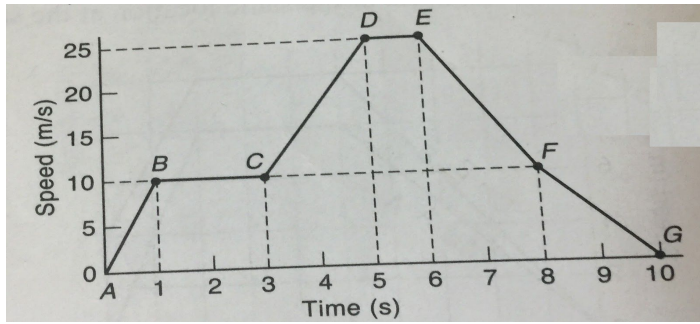


3. What was his average speed in the first 5 seconds? What was his net displacement for the entire 11 seconds?

Speed	Displacement

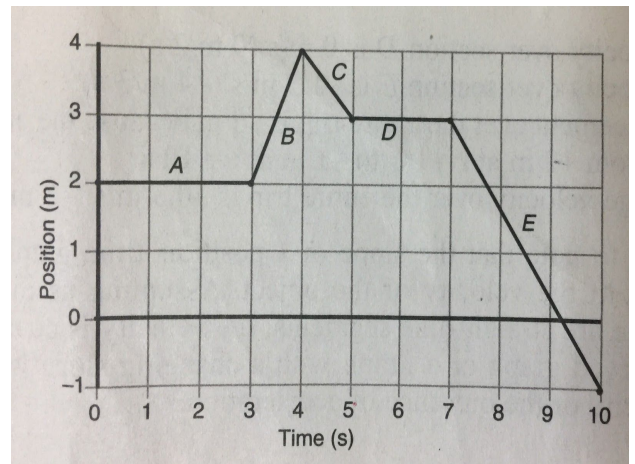


4. Use the graph below to answer the questions in the table:



Acceleration from 3 to 5 seconds.	Average speed from 6 to 8 second	Distance travel by object from 0 to 3 seconds.	Maximum speed of object during entire trip

5. Find the following information about Section A of the graph (Be careful)



**Part 3: Extra credit (Optional)**

**10 points**

Isaac went out on a 1.5 hour long bike trip and his

$P(t) = \frac{40}{3} t^2$ . After 20 miles, he saw a speed limit

sign that read : 25 MPH. Draw a diagram, graph, two secant lines and the tangent line. What is the slope of the secant line? What is the slope of the tangent line? Did Isaac break the law?

Did Mr. Bari break the law at  $(t,d) (1.22,20)$ ?



Tech Speed Limit  
**25 MPH**

Brooklyn **Tech** Police pulled over Mr. Bari to at  $(t,d) (1.22,20)$  to investigate whether he move faster than 25 MPH, with calculus.