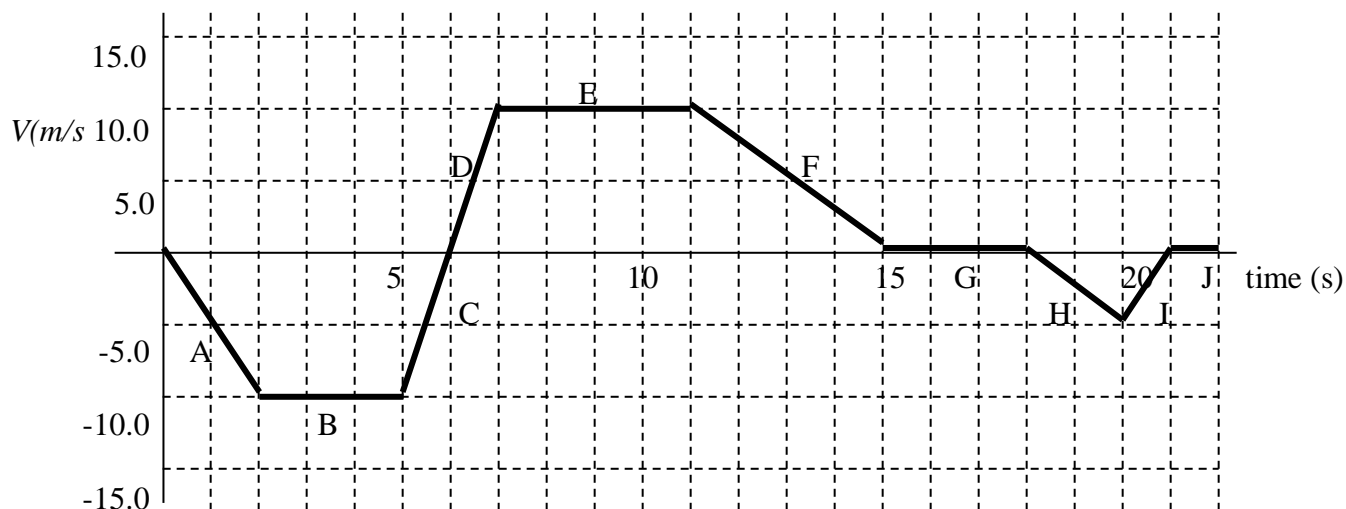


Name: _____ Date: _____

Kinematics Review (Honors. Physics)

1. The graph below describes the motion of a fly that starts out going right.



a. Identify section(s) where the fly moves with constant velocity going left.

b. Identify section(s) where the fly moves right slowing down.

c. Identify section(s) where the fly moves left speeding up.

d. When is the fly at rest?

e. What is the average velocity of the fly between 0 and 11 seconds? ($0m/s$)

f. What is the average **speed** of the fly in the same time interval? ($8.2 m/s$)

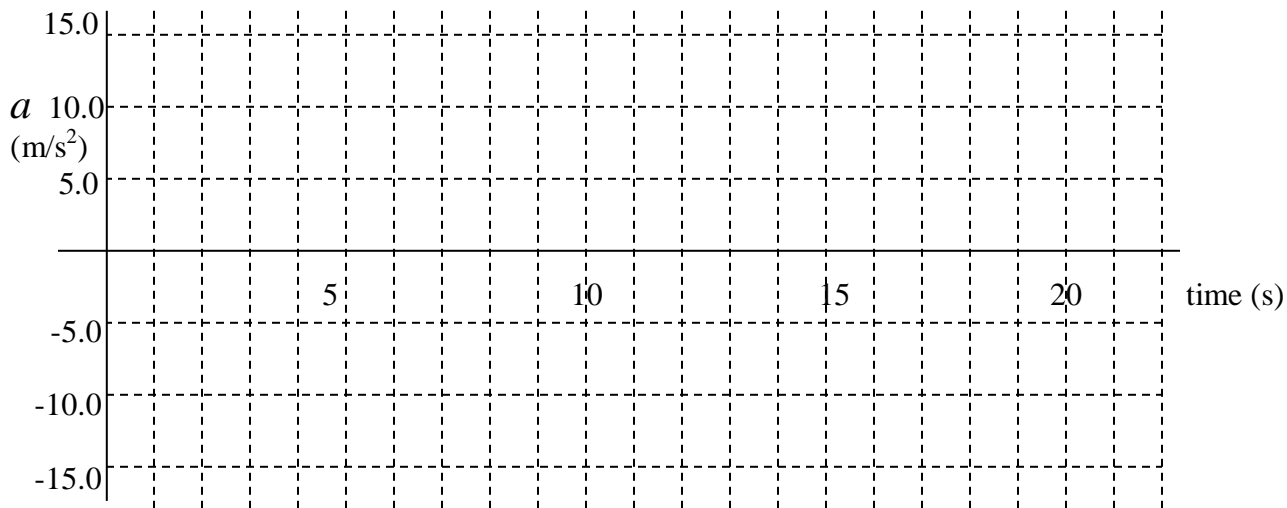
g. What is the average acceleration of the fly in this time interval? ($0.91 m/s^2$)

h. What is the total displacement of the fly from 0 to 22 seconds? ($12.5m$)

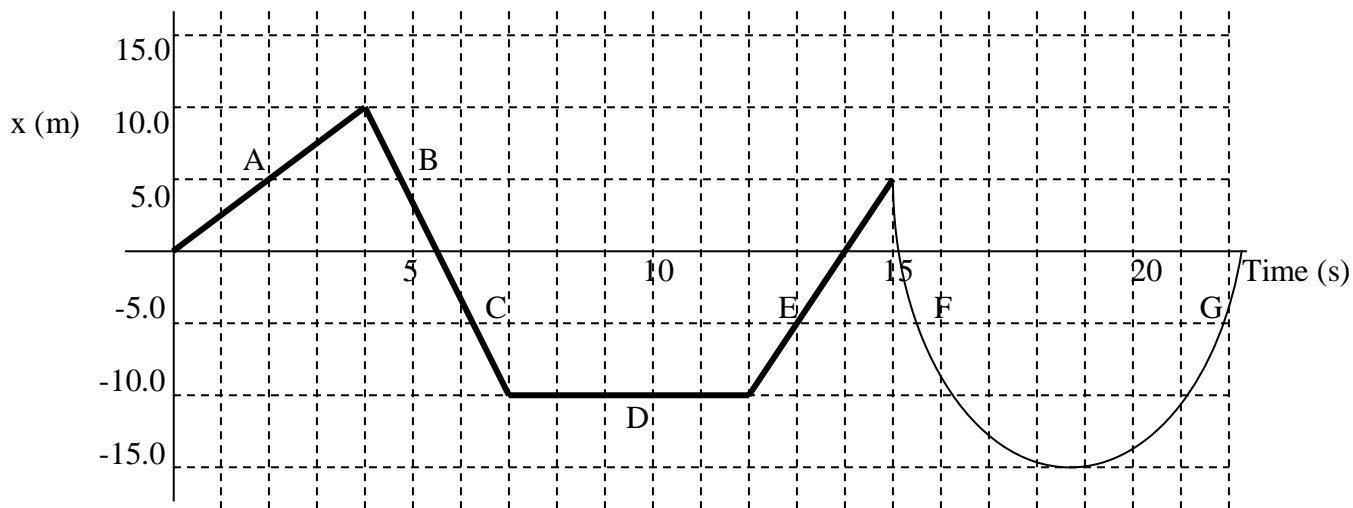
i. Identify the times when the fly changes direction.

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j. Draw an acceleration vs. time graph for the fly.



2. Little Joey plays with his remote control car, and generates the motion graph below. The car starts by moving east.



a. Identify section(s) where the car moves with constant velocity.

b. Identify section(s) where the car moves west.

c. Identify section(s) where the car speeds up.

d. When is the car at rest?

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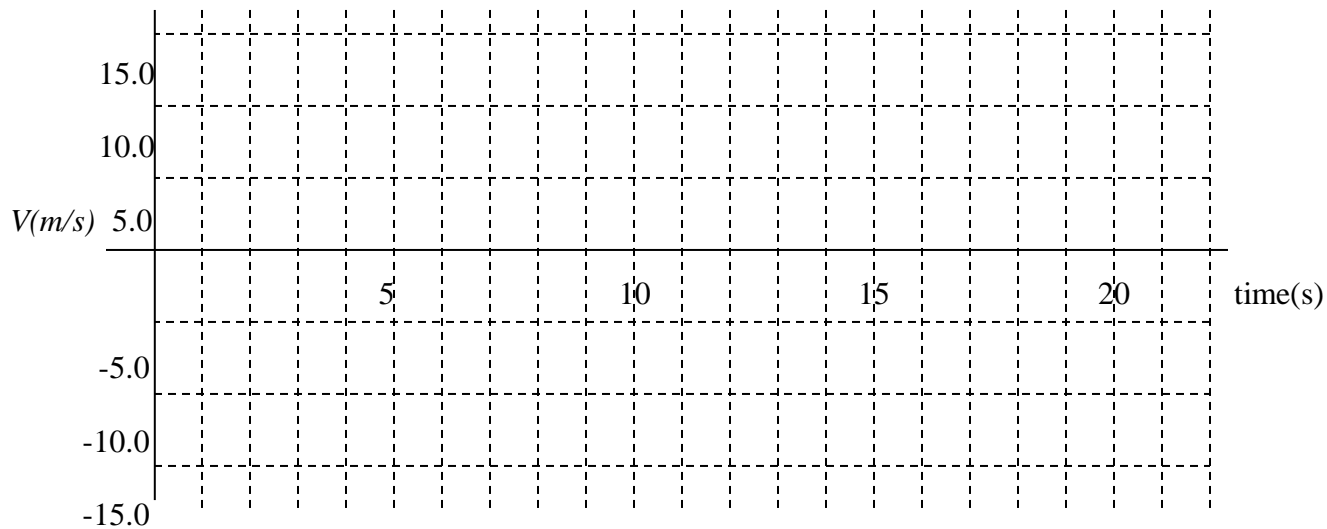
e. What is the average velocity of the car between 0 and 15 seconds? (*0.33 m/s East*)

f. What is the average **speed** of the car in the same time interval? (*3.0 m/s*)

h. What is the total displacement of the car from 0 to 22 seconds? (*3.0 m west*)

i. Describe the motion of the car in the sections F and G taken together.

j. Draw a velocity vs. time graph describing the motion of the car from 0-20s. (An approximate shape is acceptable from 15-22s)



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3. Arthur the aardvark travels 20m west, then 40 m north, then 35 m east, and finally 10m south, in 5minutes. What is the magnitude and direction(angle) of Arthur's displacement? What is his velocity? What is his speed?*(33.54m @63.4° N of E, 0.11 m/s @ 63.4° N of E, 0.35 m/s)*

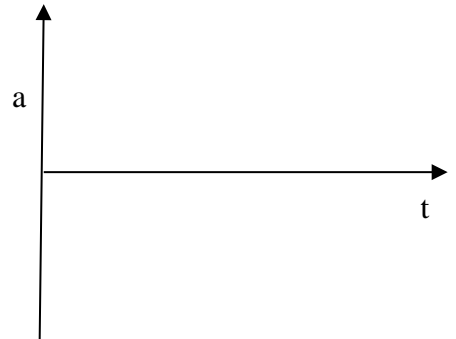
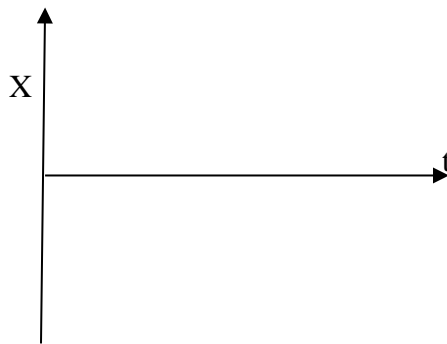
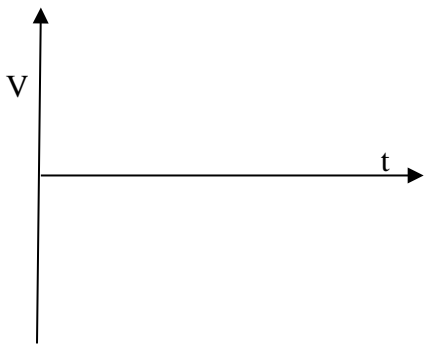
4. An architect is designing a modern airport. The largest passenger jet utilizing this airport in the future is expected to have a maximum acceleration of 3.2 m/s^2 , and a minimum takeoff speed of 165 km/hr. What is the minimum runway length for safe takeoff? *(328.2m)*

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5. A car stopped at a red light starts moving when the light turns green and accelerates at the rate of 2.7 m/s^2 for 15 seconds. The driver continues at this speed for 10 seconds until he sees the next traffic signal turning red 191 m away. He reacts after 2 seconds and slams on his brakes.

- a. What is the car's acceleration if he stops just as he reaches the light? (-7.46 m/s^2)
- b. What is the total distance covered by the car? (899.75 m)

c. Sketch v vs t, x vs t, and a vs. t graphs for this motion below.

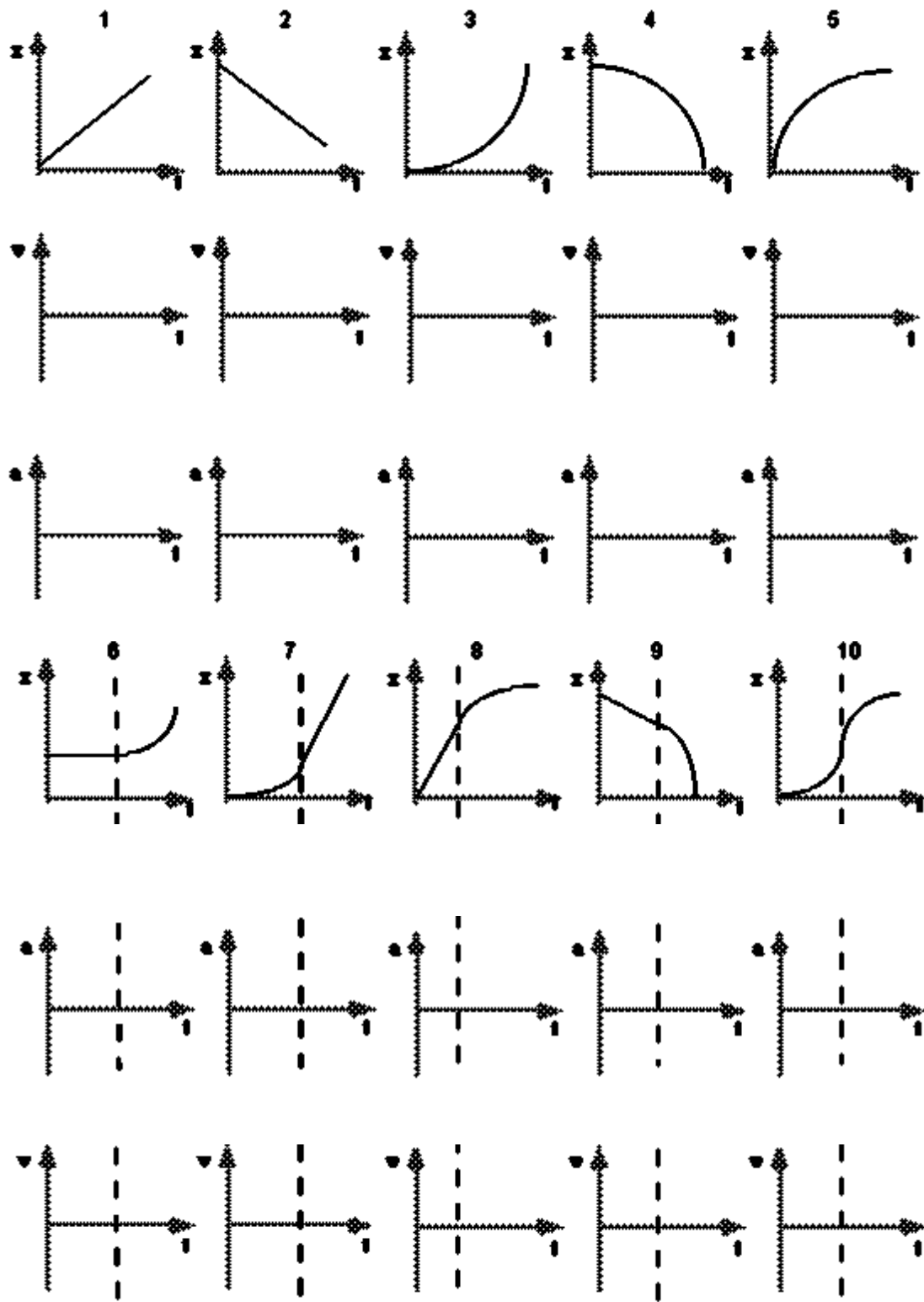


Name: _____ Date: _____

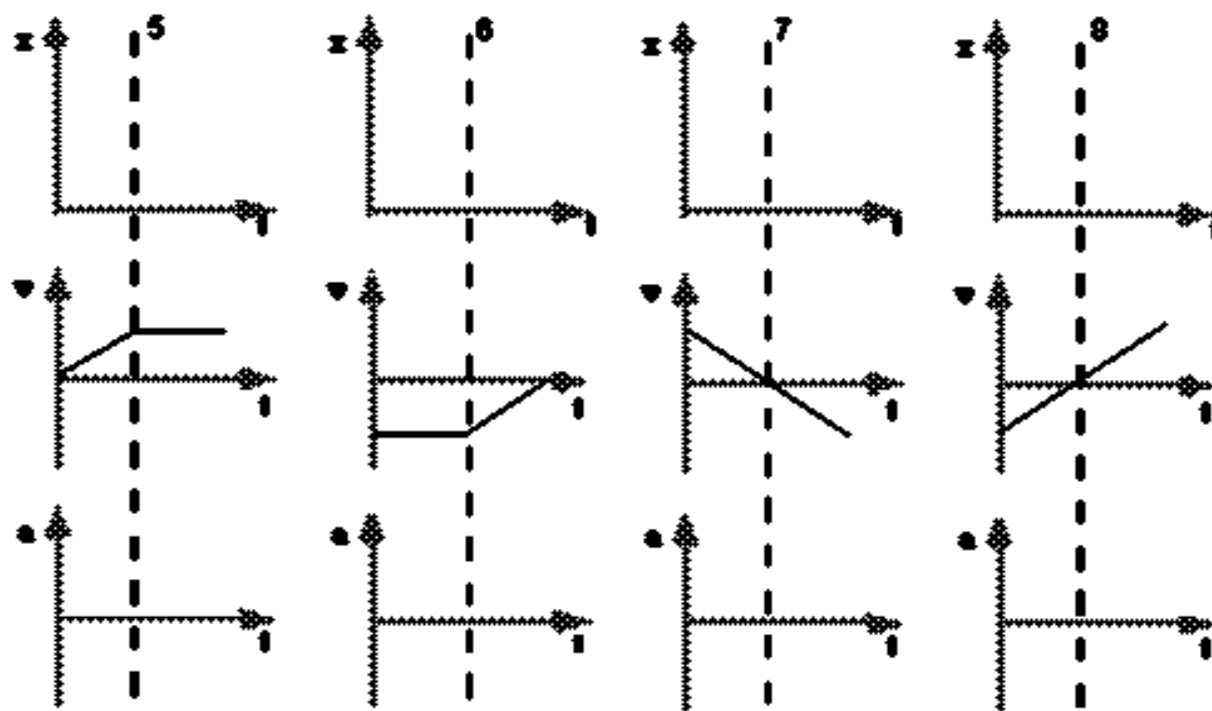
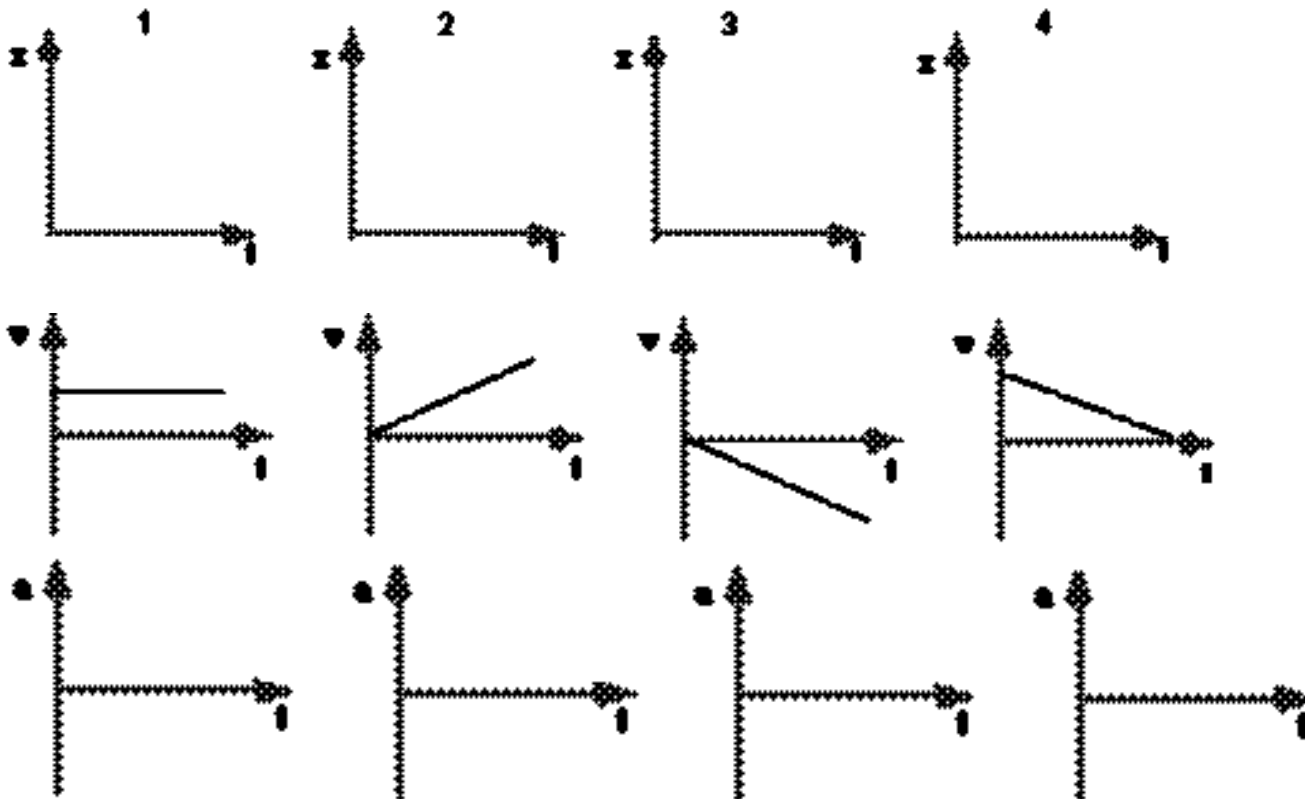
6. A police officer, waiting for the light to change at an intersection observes a car with no licence plates in the lane next to him. The light changes and the car moves forward with an acceleration of 3.0 m/s^2 . Two seconds later the officer takes off in hot pursuit with an acceleration of 3.5 m/s^2 . After what time will the officer catch the other car?(*24.4s*)

7. James leaves his home town traveling east at 70 miles per hour. An hour later Paul leaves home traveling west at 75 miles per hour. The two live 580 miles apart. How long will it be before Paul and James pass each other on the highway? How far away from James' hometown are they when they pass each other?(*3.52 hrs, 316.2 mi*)

8. Given the following position vs time graphs, sketch the corresponding velocity vs time and acceleration vs time graphs.



9. For the following velocity vs time graphs, draw the corresponding position vs time and acceleration vs time graphs.



Name: _____ Date: _____

10. A rocket is launched with an acceleration of 15 m/s^2 . After 5 seconds the first stage drops off and the rocket continues to climb with an acceleration of 8 m/s^2 until it reaches a height of 400m. The engine then shuts off.

- a. How high does the rocket rise?(*860.46m*)
- b. How long is the rocket in the air?(*30.44s*)
- c. How fast was the rocket moving when it hits the ground?(*-129.87 m/s*)
- d. Sketch y vs. t , v vs. t and a vs. t graphs for the motion of the rocket.

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11. Peter is climbing down a rock wall at the rate of 1.0 m/s, when his water bottle drops from his belt. Peter hears the sound of the bottle hitting the ground 3.0 seconds later. How high up the wall was Peter when he dropped his bottle? The speed of sound is 345 m/s. *(43.36m)*

12. A helicopter rises steadily at the rate of 2.0 m/s. When it is at a height of 1000m above the ground, the pilot accidentally drops his goggles out of the window. Sketch the path of the goggles.

- a. How long does it take the goggles to reach the ground?*(14.49 s)*
- b. How fast are the goggles traveling when they hit the ground?*(-140.01 m/s)*
- c. What is the maximum height of the goggles above the ground?*(1000.2m)*
- d. How far below the helicopter are the goggles 3 seconds after they are dropped?*(47.1m)*
- e. Sketch y vs. t , v vs. t and a vs. t graphs for the motion of the goggles.

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Answers:

1. a. E
b. C, I
c. D
d. G, J

2. a. A, B, C, E
b. B, C, F
c. G
d. D