

Name \_\_\_\_\_

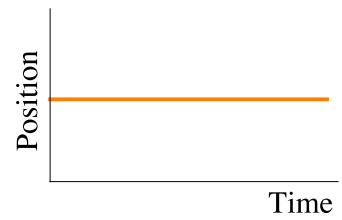
## HOMWORK FOR UNIT 3 INTRODUCTION TO MOTION

### 1. Position-Time Graphs

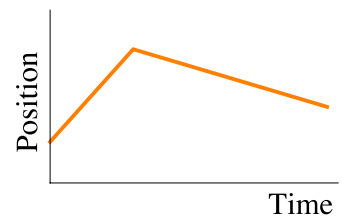
Unless otherwise noted, each numbered question is worth 2 points

Answer the following questions in the spaces provided.

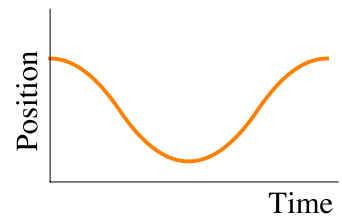
1. How do you move to create a horizontal line on a position vs. time graph?



2. How do you move so the graph goes up steeply at first, and then goes down gradually?

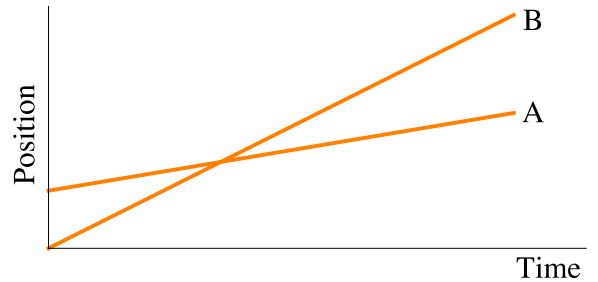


3. How do you walk to create a U-shaped graph?



Answer the following questions about two objects, A and B, whose motion is represented by the graphs shown below.

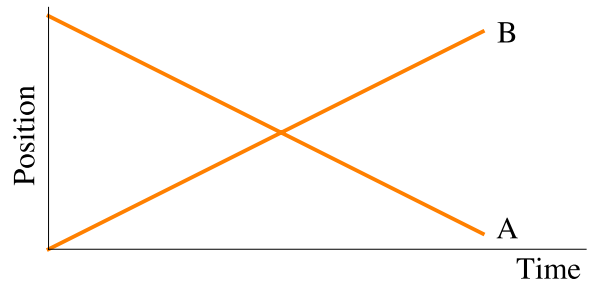
4. (a) Which object is moving faster, A or B?



- (b) Which object starts ahead? What do you mean by ahead?

5. What does the intersection mean?

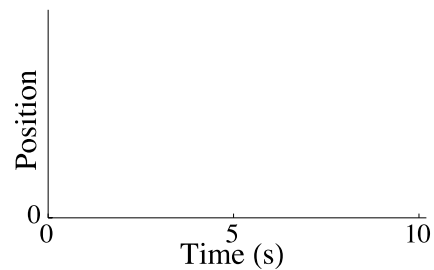
6. (a) Which object is moving faster, A or B?



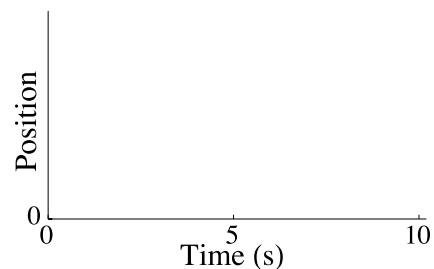
- (b) Which object has negative velocity according to the convention we have set?

Sketch the position-time graph corresponding to each of the following descriptions of the motion of an object.

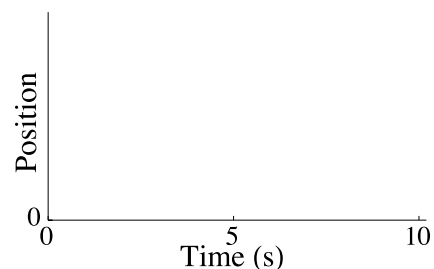
7. The object moves with a steady velocity away from the origin.



8. The object moves toward the origin with a steady velocity for 5 seconds and then stands still for 5 seconds.



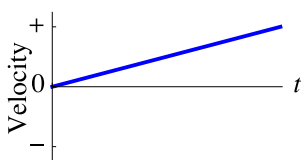
9. The object moves away from the origin for 5 seconds and then reverses direction and moves with the same speed toward the origin for 5 seconds.



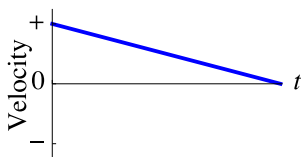
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## 2. Velocity-Time Graphs

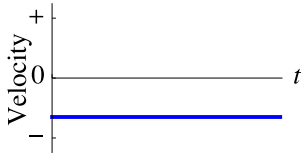
10. How do you move to create a straight-line velocity-time graph that slopes up from zero, as shown below?



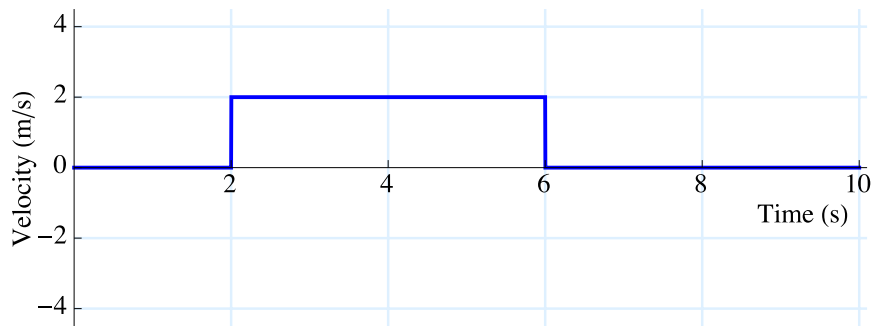
11. How do you move to create a straight-line velocity-time graph that slopes down, as shown below?



12. How do you move to make a horizontal line in the negative part of a velocity-time graph, as shown below?

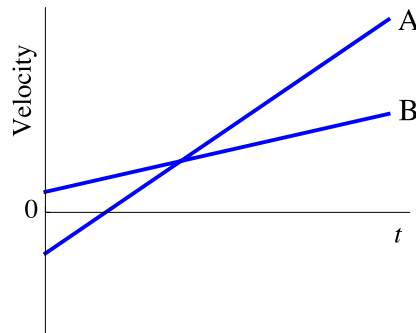


13. The velocity-time graph of an object is shown below. Figure out the total change in position (*displacement*) of the object. Show your work!



Displacement = \_\_\_\_\_ meters.

The *velocity* graph below shows the motion of two objects, A and B. Answer the following questions. Explain your answers when necessary.

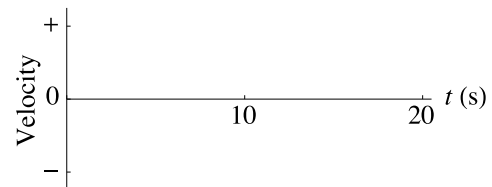


14. **(4 pts)** (a) Is one object moving at a greater speed (i.e. moving faster) than the other? If so, which one is faster? (A or B)

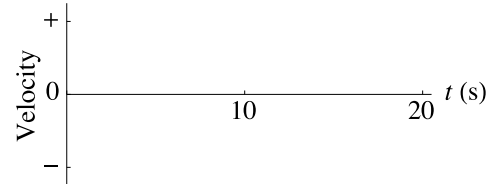
- (b) What does the intersection of the two graphs mean?
- (c) Can one tell which object is "ahead"? (define "ahead")
- (d) Does either object A or B reverse direction? Explain.

Sketch the velocity-time graph corresponding to each of the following descriptions of the motion of an object.

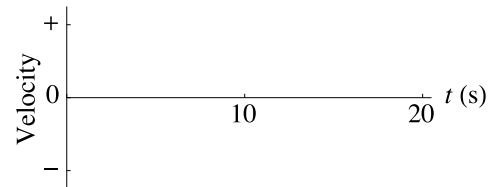
15. The object is moving away from the origin at a steady velocity.



16. The object moves toward the origin at a steady (constant) velocity for 10 seconds, and then stands still for 10 seconds.



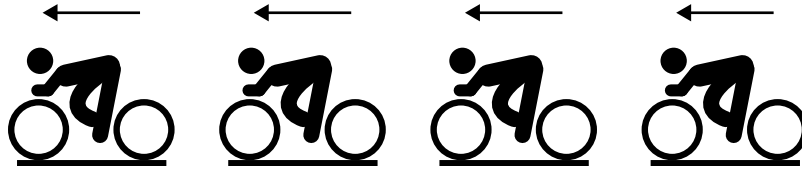
17. The object moves away from the origin at a steady (constant) velocity for 10 seconds, reverses direction and moves back toward the origin at the same speed for 10 seconds



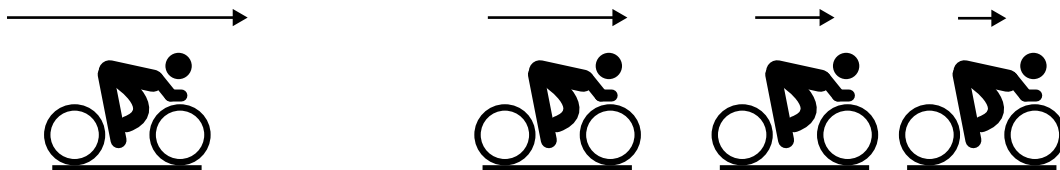
**Note:** On Q15-Q17, the sketches represent idealized graphs. A real object cannot "stop on a dime". Real motions would have more gradual transitions from one velocity to another.

### Position-Velocity Motion Diagrams

A position-velocity motion diagram can be used to sketch a quick picture of the changes in motion that an object might undergo that almost anyone can understand. A motion diagram represents the position and velocity of an object at several equally spaced times. At each position, the object's velocity is represented by an arrow.



**Figure 1:** A motion diagram of a bike moving to the left with a constant velocity. The acceleration is zero because the velocity is not changing.



**Figure 2:** A motion diagram of a bike moving to the right with a decreasing speed.

18. Construct a motion diagram for a dog running to the right with a decreasing speed.
  
19. Construct a motion diagram for a truck moving to the left with increasing speed.
  
20. Construct a motion diagram for a rocket moving vertically downward at an increasing speed.