Rectilinear Motion: Exercise 1

1. Which of the following is(are) false?
   (a) If \( s_1 > 0 \) and \( s_2 > 0 \), then \( \Delta s > 0 \) is possible.
   (b) If \( s_1 > 0 \) and \( s_2 > 0 \), then \( \Delta s < 0 \) is possible.
   (c) If \( s_1 < 0 \) and \( s_2 < 0 \), then \( \Delta s > 0 \) is possible.
   (d) If \( s_1 < 0 \) and \( s_2 < 0 \), then \( \Delta s < 0 \) is possible.
   (e) none of the above

2. Which graph represents an object at rest?
   (a) 
   (b) 
   (c) 
   (d) 
   (e) none of the above

3. How is motion in the negative x direction represented on an x vs. t plot?
   (a) By a curve to the left of the origin.
   (b) By a curve below the horizontal axis.
   (c) By a downward sloping curve.
   (d) Such a motion cannot be shown on a simple x vs. t graph.
   (e) none of the above.
Problems 4 - 7 refer to the figure below:

4. At $t = 0$ s
   (a) object C is ahead of object D.
   (b) object D is ahead of object C.
   (c) objects C and D are at the same position.
   (d) none of the above.

5. At $t = 0$ s
   (a) C is moving, and D is at rest.
   (b) D is moving, and C is at rest.
   (c) C and D are both moving.
   (d) C and D are both at rest.
   (e) none of the above.

6. At $t = 0$ s
   (a) C has a greater velocity than D.
   (b) D has a greater velocity than C.
   (c) C and D have the same velocity.
   (d) C is accelerating.
   (e) none of the above.

7. At $t = 10$ s
   (a) C and D are at the same position.
   (b) C and D have the same velocity.
   (c) the velocity of D is greater than the velocity of C.
   (d) C is in front of D.
   (e) none of the above.
8. In the position vs. clock time graphs below, all clock times are in seconds (s), and all positions are in meters (m). Rank the graphs according to which graph indicates the greater displacement from beginning to end of motion. Give the highest rank to the one(s) with the greatest displacement, and give the lowest rank to the one(s) indicating the least displacement. If two graphs indicate the same displacement, give them the same rank. Note: Zero is greater than negative, and ties are possible.

(a) \( A = E > C > F > D > B \)
(b) \( E > C > F > D > A = B \)
(c) \( C > D > A = B = F > E \)
(d) None of these graphs indicate any displacement at all.
(e) All of the displacements are the same.
(f) None of the above.

9. Describe in your own words how algebraic signs become associated with values of \( s \). What do the signs mean?
10. The plot below shows a sequence of observations made of the an object in rectilinear motion, starting at instant $t = -3$ s and ending at $t = +9$ s.

(a) Suppose we had been watching the particle and had the sense that the motion was smooth and regular rather than jerky. How would we be inclined to fill in the history between the given points?

(b) What kinds of knowledge or suppositions must we invoke besides the numerical data themselves in order to draw continuous lines or curves through a graph of experimental points?

(c) Write a table of numerical values of $\Delta s$ and the corresponding time intervals $\Delta t$ for the following pairs of points in the figure: A, C; B, D; C, D; C, E.

11. The figure below shows a number of $s$ vs $t$ plots representing hypothetical histories of rectilinear motion. Pretend you are in a car which is executing these motions, and describe each history in words (what the car is doing).