

### Describing Motion Graphically

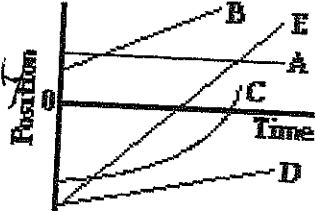
Study Lessons 3 and 4 of the 1-D Kinematics chapter at The Physics Classroom:

<http://www.physicsclassroom.com/Class/1DKin/1DKinTOC.html>

**MOP Connection:** Kinematic Graphing: sublevels 1-11 (emphasis on sublevels 9-11)

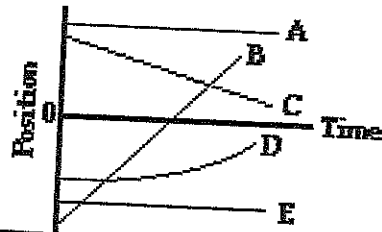
1. The slope of the line on a position vs. time graph reveals information about an object's velocity. The magnitude (numerical value) of the slope is equal to the object's speed and the direction of the slope (upward/+ or downward/-) is the same as the direction of the velocity vector. Apply this understanding to answer the following questions,

- a. A horizontal line means zero velocity
- b. A straight diagonal line means constant velocity
- c. A curved line means acceleration, changing velocity
- d. A gradually sloped line means slow velocity
- e. A steeply sloped line means fast velocity



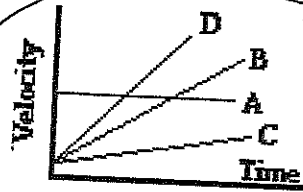
2. The motion of several objects is depicted on the position vs. time graph. Answer the following questions. Each question may have less than one, one, or more than one answer.

- \_\_\_ a. Which object(s) is(are) at rest? A + E
- \_\_\_ b. Which object(s) is(are) accelerating? D
- \_\_\_ c. Which object(s) is(are) not moving? A + E
- \_\_\_ d. Which object(s) change(s) its direction? None
- \_\_\_ e. Which object is traveling fastest? B
- \_\_\_ f. Which moving object is traveling slowest? D
- \_\_\_ g. Which object(s) is(are) moving in the same direction as object B? A + E are stopped



3. The slope of the line on a velocity vs. time graph reveals information about an object's acceleration. Furthermore, the area under the line is equal to the object's displacement. Apply this understanding to answer the following questions.

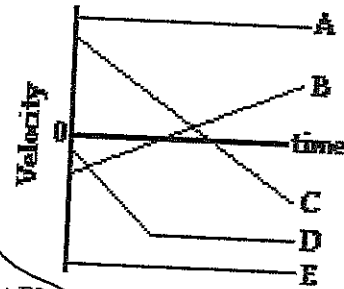
- a. A horizontal line means zero acceleration
- b. A straight diagonal line means constant acceleration
- c. A gradually sloped line means small acceleration
- d. A steeply sloped line means high acceleration



Speed up or slow down

4. The motion of several objects is depicted by a velocity vs. time graph. Answer the following questions. Each question may have less than one, one, or more than one answer.

- \_\_\_ a. Which object(s) is(are) at rest? None
- \_\_\_ b. Which object(s) is(are) accelerating? B, C, D
- \_\_\_ c. Which object(s) is(are) not moving? None
- \_\_\_ d. Which object(s) change(s) its direction? B, C
- \_\_\_ e. Which accelerating object has the smallest acceleration? D
- \_\_\_ f. Which object has the greatest acceleration? B
- \_\_\_ g. Which object(s) is(are) moving in the same direction as object E? D, C, B



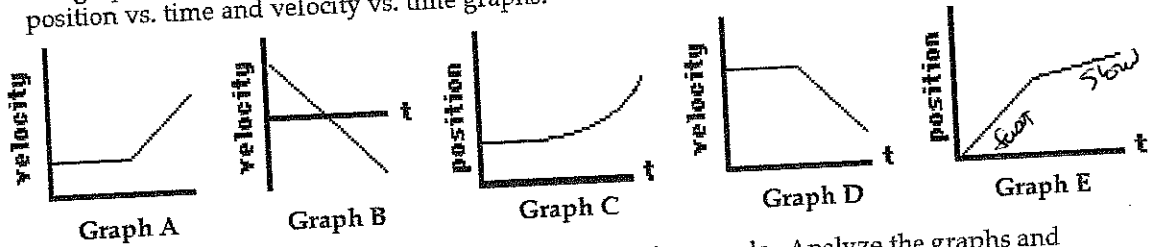
D, C, B  
↑ ↑  
end Beginning

Slopes of B, C, D look similar

D has smallest total acc. But the rates of B, C, D look same.

Motion in One Dimension

5. The graphs below depict the motion of several different objects. Note that the graphs include both position vs. time and velocity vs. time graphs.

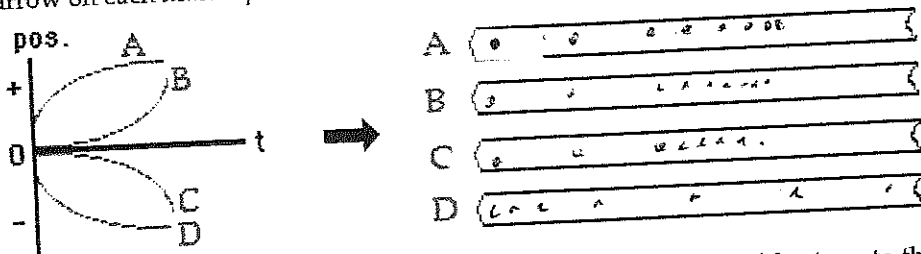


The motion of these objects could also be described using words. Analyze the graphs and match them with the verbal descriptions given below by filling in the blanks.

Verbal Description	Graph
a. The object is moving fast with a constant velocity and then moves slow with a constant velocity.	E
b. The object is moving in one direction with a constant rate of acceleration (slowing down), changes directions, and continues in the opposite direction with a constant rate of acceleration (speeding up).	B
c. The object moves with a constant velocity and then slows down.	C
d. The object moves with a constant velocity and then speeds up.	A
e. The object maintains a rest position for several seconds and then accelerates.	C

6. Consider the position-time graphs for objects A, B, C and D. On the *ticker tapes* to the right of the graphs, construct a dot diagram for each object. Since the objects could be moving right or left, put an arrow on each *ticker tape* to indicate the direction of motion.

Stop motion



7. Consider the velocity-time graphs for objects A, B, C and D. On the *ticker tapes* to the right of the graphs, construct a dot diagram for each object. Since the objects could be moving right or left, put an arrow on each *ticker tape* to indicate the direction of motion.

