

11. A particle moves along the x-axis with a nonconstant acceleration described by  $a = 12t$ , where  $a$  is in meters per second squared and  $t$  is in seconds. If the particle starts from rest so that its speed  $v$  and position  $x$  are zero when  $t = 0$ , where is it located when  $t = 2$  seconds?  
 (A)  $x = 12$  m (B)  $x = 16$  m (C)  $x = 24$  m (D)  $x = 32$  m (E)  $x = 48$  m

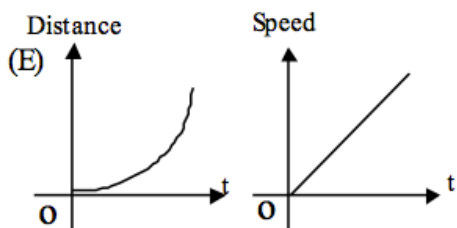
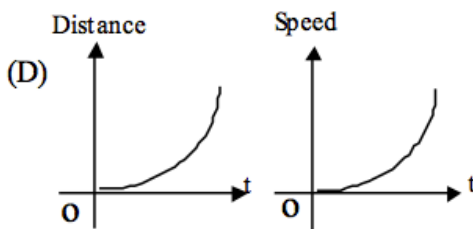
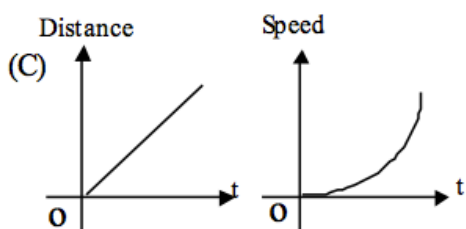
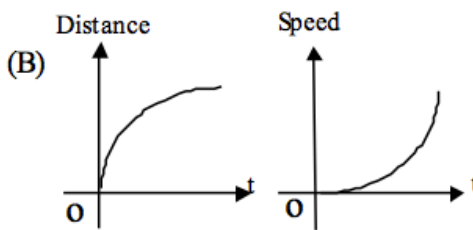
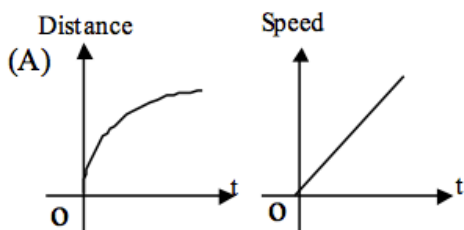
**Questions 14-15**

An object moving in a straight line has a velocity  $v$  in meters per second that varies with time  $t$  in seconds according to the following function.

$$v = 4 + 0.5 t^2$$

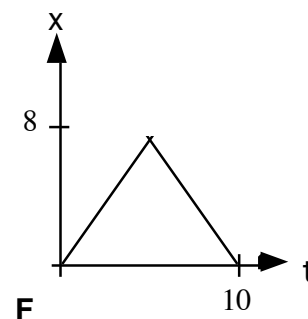
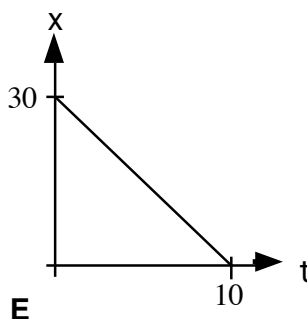
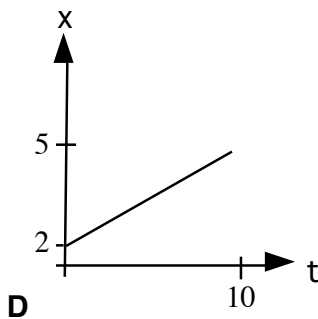
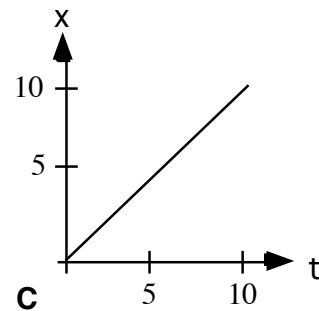
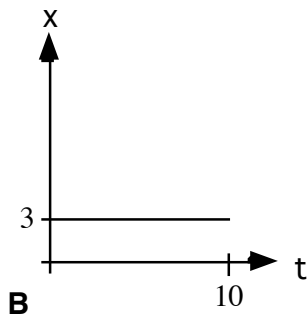
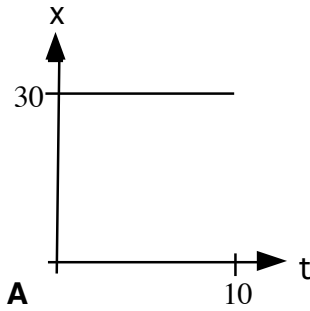
14. The instantaneous acceleration of the object at  $t = 2$  seconds is  
 (A)  $2 \text{ m/s}^2$  (B)  $4 \text{ m/s}^2$  (C)  $5 \text{ m/s}^2$  (D)  $6 \text{ m/s}^2$  (E)  $8 \text{ m/s}^2$
15. The displacement of the object between  $t = 0$  and  $t = 6$  seconds is  
 (A)  $22$  m (B)  $28$  m (C)  $40$  m (D)  $42$  m (E)  $60$  m

Which of the following pairs of graphs shows the distance traveled versus time and the speed versus time for an object uniformly accelerated from rest?



## Position Time Graphs—Displacement <sup>8</sup>

In the position vs. time graphs below, all the times are in seconds (s), and all the positions are in meters (m). Rank these graphs on the basis of which graph indicates the greatest 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.



Greatest 1 \_\_\_\_\_ 2 \_\_\_\_\_ 3 \_\_\_\_\_ 4 \_\_\_\_\_ 5 \_\_\_\_\_ 6 \_\_\_\_\_ Least

Or, none of these graphs indicate any displacement at all. \_\_\_\_\_

Or, all of the displacements are the same. \_\_\_\_\_

Please carefully explain your reasoning.

How sure were you of your ranking? (Circle one)

Basically Guessed Sure Very Sure  
 1      2      3      4      5      6      7      8      9      10

<sup>8</sup> K. W. Nicholson

# Hints Page

11. How do you go from accel back to velocity and back to position using calculus?

14. How do you go from velocity to acceleration using calculus?

15. How do you go from velocity back to position using calculus?

[Graphs mc]. What does constant accel look like on the v vs t graph?

Ranking Task: Position Time Graphs - Displacement: displacement is the change in position.

# Answers Page

11. B

14. A

15. E

[Graphs mc]. E

Ranking Task: Position Time Graphs - Displacement:  
greatest - C, D, [A, B, F], E - least