

I.7 Particle Motion Practice

14. The velocity of a particle moving along the x -axis is given by $v(t) = \sin(2t)$ at time t . If the particle is at $x = 4$ when $t = 0$, what is the position of the particle when $t = \frac{\pi}{2}$?
- (A) 2 (B) 3 (C) 4 (D) 5 (E) 6

76. A particle moves along a straight line so that at time $t > 0$ the position of the particle is given by $s(t)$, the velocity is given by $v(t)$, and the acceleration is given by $a(t)$. Which of the following expressions gives the average velocity of the particle on the interval $[2, 8]$?

(A) $\frac{1}{6} \int_2^8 a(t) dt$

(B) $\frac{1}{6} \int_2^8 s(t) dt$

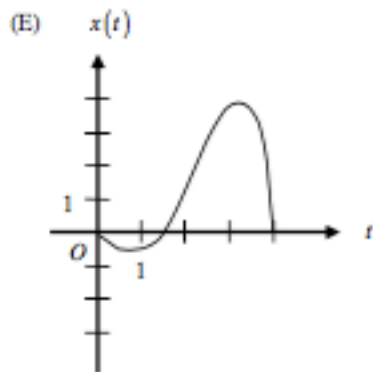
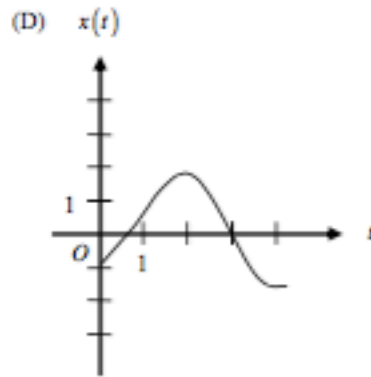
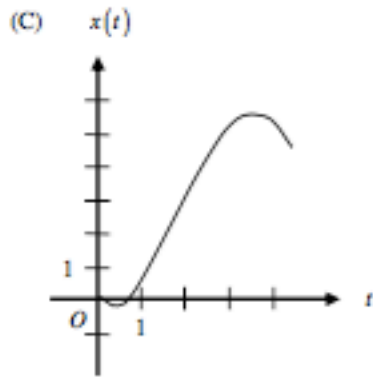
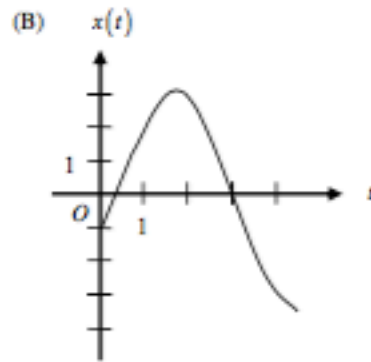
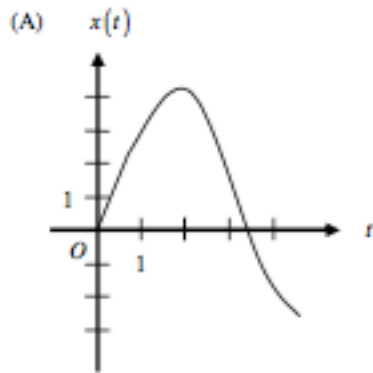
(C) $\frac{s(8) - s(2)}{6}$

(D) $\frac{v(8) - v(2)}{6}$

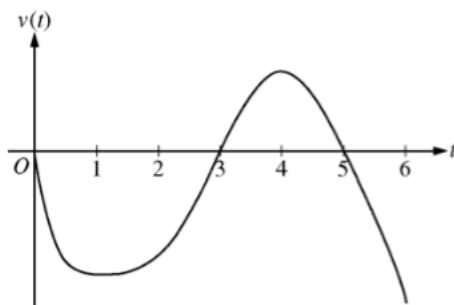
(E) $v(8) - v(2)$

t	0	1	2	3	4
$v(t)$	-1	2	3	0	-4

86. The table gives selected values of the velocity, $v(t)$, of a particle moving along the x -axis. At time $t = 0$, the particle is at the origin. Which of the following could be the graph of the position, $x(t)$, of the particle for $0 \leq t \leq 4$?



BC 2008 #4 No Calc

Graph of v

A particle moves along the x -axis so that its velocity at time t , for $0 \leq t \leq 6$, is given by a differentiable function v whose graph is shown above. The velocity is 0 at $t = 0$, $t = 3$, and $t = 5$, and the graph has horizontal tangents at $t = 1$ and $t = 4$. The areas of the regions bounded by the t -axis and the graph of v on the intervals $[0, 3]$, $[3, 5]$, and $[5, 6]$ are 8, 3, and 2, respectively. At time $t = 0$, the particle is at $x = -2$.

- For $0 \leq t \leq 6$, find both the time and the position of the particle when the particle is farthest to the left. Justify your answer.
- For how many values of t , where $0 \leq t \leq 6$, is the particle at $x = -8$? Explain your reasoning.
- On the interval $2 < t < 3$, is the speed of the particle increasing or decreasing? Give a reason for your answer.
- During what time intervals, if any, is the acceleration of the particle negative? Justify your answer.

AB 2007 #4 No Calc

A particle moves along the x -axis with position at time t given by $x(t) = e^{-t} \sin t$ for $0 \leq t \leq 2\pi$.

- (a) Find the time t at which the particle is farthest to the left. Justify your answer.
- (b) Find the value of the constant A for which $x(t)$ satisfies the equation $Ax''(t) + x'(t) + x(t) = 0$ for $0 < t < 2\pi$.