

Section 7.1 Exercises

In Exercises 1–8, the function $v(t)$ is the velocity in m/sec of a particle moving along the x -axis. Use analytic methods to do each of the following:

(a) Determine when the particle is moving to the right, to the left, and stopped.

(b) Find the particle's displacement for the given time interval.

(c) Find the total distance traveled by the particle.

1. $v(t) = 5 \cos t, \quad 0 \leq t \leq 2\pi$

2. $v(t) = 6 \sin 3t, \quad 0 \leq t \leq \pi/2$

3. $v(t) = 49 - 9.8t, \quad 0 \leq t \leq 10$

4. $v(t) = 6t^2 - 18t + 12, \quad 0 \leq t \leq 2$

5. $v(t) = 5 \sin^2 t \cos t, \quad 0 \leq t \leq 2\pi$

6. $v(t) = \sqrt{4-t}, \quad 0 \leq t \leq 4$

7. $v(t) = e^{\sin t} \cos t, \quad 0 \leq t \leq 2\pi$

8. $v(t) = \frac{t}{1+t^2}, \quad 0 \leq t \leq 3$

9. An automobile accelerates from rest at $1 + 3\sqrt{t}$ mph/sec for 9 seconds.

(a) What is its velocity after 9 seconds?

(b) How far does it travel in those 9 seconds?

(c) The particle travels with velocity

$$v(t) = (t-2) \sin t \text{ m/sec}$$

for $0 \leq t \leq 4$ sec.

(a) What is the particle's displacement?

(b) What is the total distance traveled?

11. **Projectile** Recall that the acceleration due to Earth's gravity is 32 ft/sec^2 . From ground level, a projectile is fired straight upward with velocity 90 feet per second.

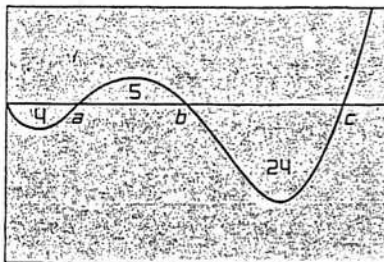
(a) What is its velocity after 3 seconds?

(b) When does it hit the ground?

(c) When it hits the ground, what is the net distance it has traveled?

(d) When it hits the ground, what is the total distance it has traveled?

In Exercises 12–16, a particle moves along the x -axis (units in cm). Its initial position at $t = 0$ sec is $x(0) = 15$. The figure shows the graph of the particle's velocity $v(t)$. The numbers are the areas of the enclosed regions.



12. What is the particle's displacement between $t = 0$ and $t = c$?

13. What is the total distance traveled by the particle in the same time period?

14. Give the positions of the particle at times a , b , and c .

15. Approximately where does the particle achieve its greatest positive acceleration on the interval $[0, b]$?

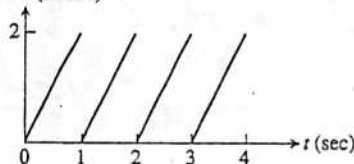
16. Approximately where does the particle achieve its greatest positive acceleration on the interval $[0, c]$?

In Exercises 17–20, the graph of the velocity of a particle moving on the x -axis is given. The particle starts at $x = 2$ when $t = 0$.

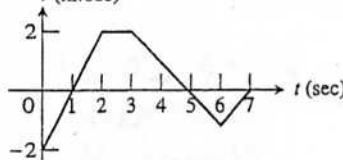
(a) Find where the particle is at the end of the trip.

(b) Find the total distance traveled by the particle.

17. v (m/sec)



19. v (m/sec)



21. **U.S. Oil Consumption** The rate of consumption of oil in the United States during the 1980s (in billions of barrels per year) is modeled by the function $C = 27.08 \cdot e^{t/25}$, where t is the number of years after January 1, 1980. Find the total consumption of oil in the United States from January 1, 1980 to January 1, 1990.

1. a) rt: $[0, \frac{\pi}{2}] \cup (\frac{3\pi}{2}, 2\pi]$ left: $(\frac{\pi}{2}, \frac{3\pi}{2})$ Stopped: $\frac{\pi}{2}, \frac{3\pi}{2}$
 b) 0 c) 20

2. rt: $(0, \frac{\pi}{3})$ left: $(\frac{\pi}{3}, \frac{\pi}{2}]$ Stopped: $0, \frac{\pi}{3}$
 b) 2 c) 6

3. rt $[0, 5)$ left $(5, 10]$ Stopped: 5
 b) 0 c) 245

4. rt $[0, 1)$ left $(1, 2)$ Stopped: 1, 2
 b) 4 c) 6

5. rt $(0, \frac{\pi}{2}) \cup (\frac{3\pi}{2}, 2\pi)$ left $(\frac{\pi}{2}, \pi) \cup (\pi, \frac{3\pi}{2})$ Stopped: $0, \frac{\pi}{2}, \pi, \frac{3\pi}{2}, 2\pi$
 b) 0 c) $\frac{20}{3}$

6. rt $[0, 4)$ left: never Stopped: 4
 b) $\frac{16}{3}$ c) $\frac{16}{3}$

7. rt $[0, \frac{\pi}{2}) \cup (\frac{3\pi}{2}, 2\pi]$ left $(\frac{\pi}{2}, 3\pi/2)$ Stopped: $\frac{\pi}{2}, \frac{3\pi}{2}$
 b) 0 c) ≈ 4.7

8. rt $(0, 3]$ left never Stopped: 0
 b) $\frac{1 \cdot 10}{2} \approx 1.15$
 c) 1.15

9. a) 63 mph b) 344.52 ft

10. a) -1.44952 m b) 1.91411 m

11. a) -6 ft/s b) 5.625 sec c) 0 d) 253.125 ft

12. -23 cm 13. 33 cm 14 a: 11 b: 16 c: -8 15. t=a 16. t=c

17 a) 6 b) 4 m 18. a) 2 b) 4 m 19. a) 5 b) 7 m 21. 332.965 billion barrels

Ans. 7.1 DeMaana

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