Exercises

(a) The particle is stopped at $t = \frac{\pi}{2}$ and $t = \frac{3\pi}{2}$; the particle is moving right on the interval $\left(0, \frac{\pi}{2}\right)$ and $\left(\frac{3\pi}{2}, 2\pi\right)$; the particle is moving left on the interval $\left(\frac{\pi}{2}, \frac{3\pi}{2}\right)$.

(b) Total displacement = 0.

(c) Total distance traveled = 20.

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2

(a) The particle moves right when $t \in \left[0, \frac{\pi}{3}\right]$, moves left when $t \in \left(\frac{\pi}{3}, \frac{\pi}{2}\right]$, and is stationary when $t \in \left\{0, \frac{\pi}{3}\right\}$

(b) The total displacement of the particle is 2.

(c) The total distance traveled by the particle is 6.

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3

(a) The particle moves right when $t \in [0, 5)$, is stationary when $t = 5$, and moves left when $t \in (5, 10]$.

(b) The total displacement of the particle is 0.

(c) The total distance traveled by the particle is 245.

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4

(a) The particle moves right when $t \in [0, 1)$, is stationary when $t = 1$ and $t = 2$, and moves left when $t \in (1, 2)$.

(b) The total displacement of the particle is 4.

(c) The total distance traveled by the particle is 6.
(a) stopped: \( t = 0, \frac{\pi}{2}, \pi, \frac{3\pi}{2}, 2\pi \)
right: \( (0, \frac{\pi}{2}) \cup (\frac{3\pi}{2}, 2\pi) \)
left: \( (\frac{\pi}{2}, \frac{3\pi}{2}) \)

(b) The particle’s displacement is 0; the particle’s final position is 3.

(c) The total distance traveled is \( \frac{20}{3} \).

(a) The particle moves right when \( t \in [0, 4) \) and is stationary when \( t = 4 \).

(b) The total displacement of the particle is \( \frac{16}{3} \).

(c) The total distance traveled by the particle in this case is the same as the displacement, \( \frac{16}{3} \).

(a) The particle moves right when \( t \in [0, \pi/2) \cup (3\pi/2, 2\pi] \), is stationary when \( t \in \{\pi/2, 3\pi/2\} \) and moves left when \( t \in (\pi/2, 3\pi/2) \).

(b) The total displacement of the particle is 0.

(c) The total distance traveled by the particle is approximately 4.7.

(a) stopped: \( t = 0 \)
right: \( (0, 3) \)
left: none

(b) The particle’s displacement is \( \frac{1}{2} \ln 10 \).

(c) The total distance traveled is \( \frac{1}{2} \ln 10 \).

(a) 63 MPH
(b) 344.52 ft
10  (a) Approximately $-1.45$ meters.
    (b) Approximately $1.914$ meters.

11  (a) $-6$ ft/sec or $6$ ft/sec in the downwards direction.
    (b) $5.625$ seconds
    (c) $0$ feet
    (d) $253.125$ feet

12  $-23$ cm

13  $33$

14  $x(a) = 11, x(b) = 16, x(c) = -8$

15  Point $a$

16  Point $c$

17  (a) $x = 6$
    (b) $4$

18  (a) $x = 2$
    (b) $4$
19  
(a) $x = 5$
(b) 7

20  
(a) $x = -2.5$
(b) 19.5

21  332.965 billion barrels

22  93.6 kilowatt-hours