

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) 2 c) 6
2. rt: $(0, \frac{\pi}{3})$ left: $(\frac{\pi}{3}, \frac{\pi}{2}]$ stopped: $0, \frac{\pi}{3}$
 b) 0 c) 245
3. rt $[0, 5)$ left $(5, 10]$ stopped: 5
 b) 4 c) 6
4. rt $[0, 1)$ left $(1, 2)$ stopped: 1, 2

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) $\frac{1+10}{2} \approx 1.15$ 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

Distance/Displacement Practice: (watch video on website under integral applications, and then do the following)

Key

1. The velocity v of an object travelling on a straight line is given by $v = 2t - t^2$ m/sec, $0 \leq t \leq 4$. Find in the indicated time interval:
 $\int_0^4 |2t - t^2| dt = 8m$
 a. The distance travelled by the object.
 b. The displacement of the object. $\int_0^4 2t - t^2 dt = -\frac{16}{3} m$
2. An object travelling on the x -axis has at time t a velocity of $v(t) = \cos(\frac{\pi}{3}t)$ m/sec.
 a. What is its direction and speed at time $t = 0$ sec? $v(0) = 1$ m/s so speed = 1 m/s direction: right
 b. What is its direction and speed at time $t = 3$ sec? $v(3) = -1$ m/s so speed = 1 m/s dir: left
 c. Find the distance it has travelled from time $t = 0$ sec to time $t = 3$ sec. $\int_0^3 |\cos(\frac{\pi}{3}t)| dt \approx 1.91 m$
 d. Where is it at time $t = 3$ sec relative to where it was at time $t = 0$ sec? (Hint: Find displacement.)
 $\int_0^3 \cos(\frac{\pi}{3}t) dt = 0 m$
3. The velocity v of an object travelling on a straight line is given by $v = |t - 5|$ m/sec, $0 \leq t \leq 8$. Find in the indicated time interval:
 $\int_0^8 |t - 5| dt = 17m$
 a. The distance travelled by the object.
 b. The displacement of the object. 17m
4. A body moves on the x -axis with acceleration $a(t) = \frac{d^2x}{dt^2} = 6t$ m/sec². It starts at time $t = 0$ with initial velocity $v_0 = -3$ m/sec.
 a. Find the velocity $v(t)$ as a function of t . $v(t) = 3t^2 - 3$
 b. Find the total distance s travelled by the body from time $t = 0$ sec to time $t = 4$ sec. $\int_0^4 |3t^2 - 3| dt = 56/3 m$
 c. Where is its position at time $t = 4$ sec relative to its position at time $t = 0$ sec?
5. An object moves on a straight line with velocity $v(t) = 2e^{-t}$ km/h for $t \geq 0$.
 a. Find the distance $s(t)$ the object has moved as a function of time t .
 b. How far does the object move throughout eternity?
 $\int_0^{\infty} 2e^{-t} dt = 2 km$
 displacement = 52 m so position is 52 m to right of start.