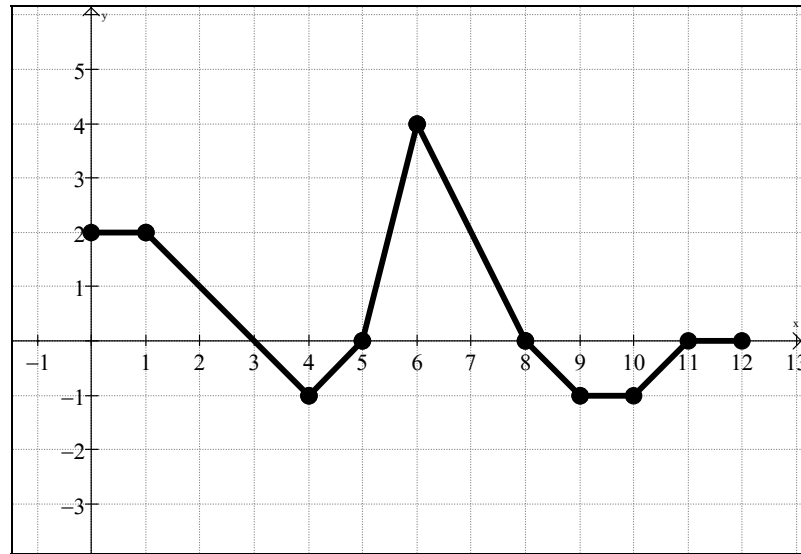


## Particle Problem #1

Given: Graph of  $V(t)$  and  $s(0) = 4$



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1.  $v(2) =$

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2.  $a(2) =$

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3. Given  $s(0) = 4$ , find  $s(2)$

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4. When does particle move to the right?

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5. When does particle move to the left?

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6. How many times does the particle change direction?

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7. When does the particle speed up?

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8. When does the particle slow down?

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9. When is the particle at rest for an instant?

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10. When is the particle at rest for more than an instant?

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11. When is acceleration positive?

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12. When is acceleration negative?

---

13. When is acceleration zero?

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14. How much is the maximum acceleration?

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15. What is the **total distance** traveled by the particle in 12 seconds?

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16. When is the particle farthest to the right?

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17. Given  $s(0) = 4$ , how far to the right [maximum] does it go?

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18. At what (if any) time(s) does  $s(t) = 9$  ?

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19. Find the **average acceleration** of the particle from  $0 \leq t \leq 12$  seconds.

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20. Find the **average velocity** of the particle from  $0 \leq t \leq 12$  seconds.

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21. Find the **average position** of the particle from  $0 \leq t \leq 12$  seconds.

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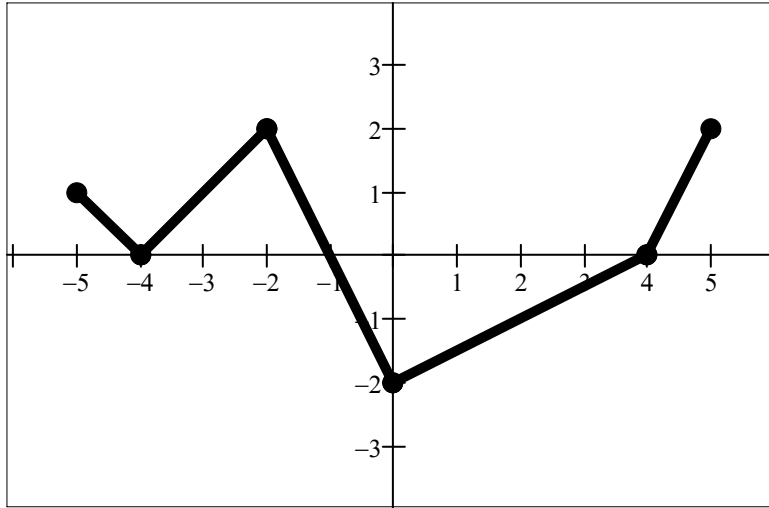
**Particle Problem #1**

**Answers:**

1. 1	12. (1,4)(6,8)(8,9)
2. -1	13. (0,1)(9,10)(11,12)
3. 7.5	14. 4
4. [0,3),(5,8)	15. 13
5. (3,5)(8,11)	16. 8
6. 3 times	17. 13
7. (3,4)(5,6)(8,9)	18. 6
8. (1,3)(4,5)(6,8)(10,11)	19. $\frac{v(12) - v(0)}{12 - 0} = \frac{0 - 2}{12} = \frac{-1}{6}$
9. t = 3, t = 5, t = 8	20. Use average value theorem: $\frac{4 + (-1) + 6 + (-2)}{12} = \boxed{\frac{7}{12}}$
10. [11,12]	21. Use Avg. Value Theorem with Reimann Sums (Trap) $= \frac{1}{2} [s(0) + 2s(1) + 2s(2) + \dots + 2s(11) + s(12)] = \frac{225}{2} \left( \frac{1}{12} \right) = \boxed{\frac{75}{8}}$
11. (4,5)(5,6)(10,11)	

## Particle Problem #2

Given: Graph of  $v(t)$   $\{-5 \leq t \leq 5\}$  and  $s(0) = 4$



1.  $v(2) =$
2.  $a(2) =$
3. Given  $s(0) = 4$ , find  $s(2)$
4. When does particle move to the right?
5. When does particle move to the left?
6. How many times does the particle change direction?
7. When does the particle speed up?
8. When does the particle slow down?
9. When is the particle at rest for an instant?
10. When is the particle at rest for more than an instant?
11. When is acceleration positive?
12. When is acceleration negative?
13. When is acceleration zero?
14. How much is the maximum acceleration?
15. What is the **total distance** traveled by the particle in the 10 second interval?
16. When is the particle farthest to the right?
17. Given  $s(0) = 4$ , how far to the right [maximum] does it go?
18. Given  $s(0) = 4$ , At what (if any) time(s) does  $s(t) = 0$  ?
19. Find the **average acceleration** of the particle from  $-5 \leq t \leq 5$  seconds.
20. Find the **average velocity** of the particle from  $-5 \leq t \leq 5$  seconds.
21. Find the **average position** of the particle from  $-5 \leq t \leq 5$  seconds.

## Particle Problem #2

### Answers:

1. -1	12. $(-5, -4)(-2, 0)$
2. $\frac{1}{2}$	13. never
3. 1	14. 2
4. $(-5, -4)(-4, -1)(4, 5)$	15. $\frac{19}{2}$
5. $(-1, 4)$	16. -1
6. 2	17. 5
7. $(-4, -2)(-1, 0)(4, 5)$	18. 4
8. $(-5, -4)(-2, -1)(0, 4)$	19. $\frac{v(5) - v(-5)}{5 - (-5)} = \frac{2 - 1}{10} = \boxed{\frac{1}{10}}$
9. -4, -1, 4	20. $\frac{1}{10} \left[ \frac{1}{2} + 3 - 5 + 1 \right] = \boxed{\frac{-1}{20}}$
10. never	21. $\frac{1}{10} \left[ \frac{7}{4} + 5 + \frac{25}{2} + \frac{1}{2} \right] = \boxed{\frac{79}{40}}$ See graph of $s(t)$ below ↓
11. $(-4, -2)(0, 4)(4, 5)$	<p><b>GRAPH OF <math>s(t)</math></b></p>