Test 1

Working Solution

Item 1

Part A

When can we be certain that the average velocity of an object is always equal to its instantaneous velocity?

- only when the acceleration is constant
- only when the acceleration is changing at a constant rate
- never
- always
- only when the velocity is constant

Submit My Answers Give Up

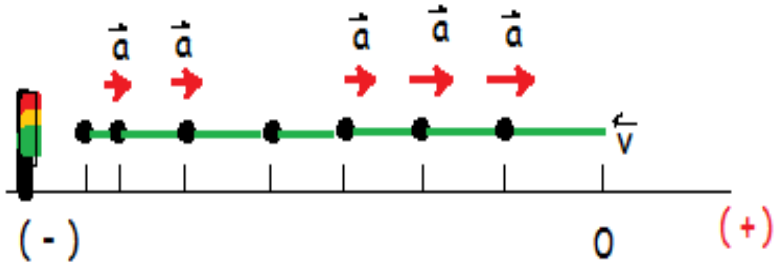
Correct

Item 2

Part A

Suppose that a car traveling to the west (the -*x* direction) begins to slow down as it approaches a traffic light. Which statement concerning its acceleration in the *x* direction is correct?

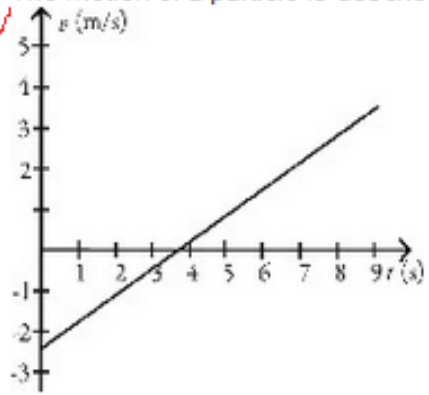
- Its acceleration is negative but its velocity is positive.
- Its acceleration is positive but its velocity is negative.
- Both its acceleration and its velocity are negative.
- Both its acceleration and its velocity are positive.



Item 3

Part A

The motion of a particle is described in the velocity versus time graph shown in the figure. We can say that its speed



- decreases and then increases.
- increases.
- increases and then decreases.
- decreases.

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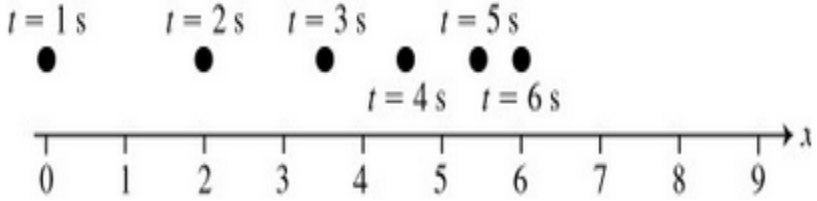
Item 4

Part A

The figure shows the position of an object (moving along a straight line) as a function of time. Assume two significant figures in each number. Which of the following statements about this object is true over the interval shown?



- The average speed of the object is 1.0 m/s.
- The object is accelerating to the right.
- The acceleration of the object is in the same direction as its velocity.
- The object is accelerating to the left.

The velocity is pointing to the right, and reducing.

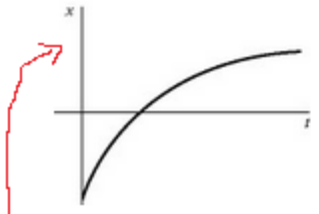
The acceleration is pointing to the left, and diminishing to zero at 6s.

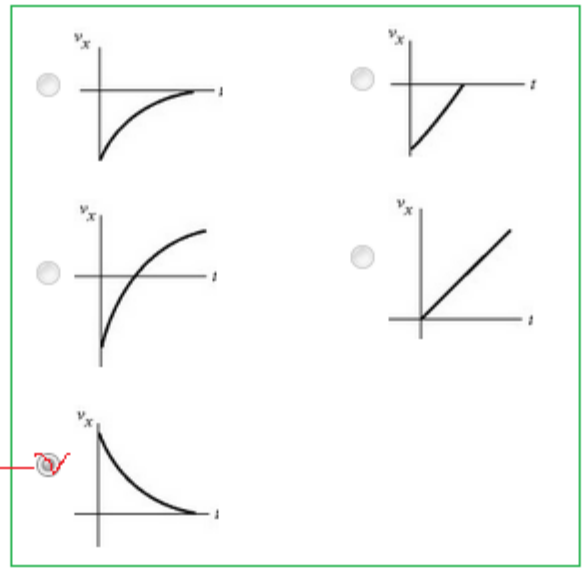
Item 5

Part A

The figure shows the graph of the position x as a function of time for an object moving in the straight line (the x-axis).

Which of the following graphs best describes the velocity along the x-axis as a function of time for this object?



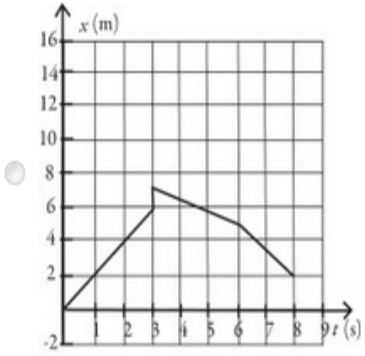


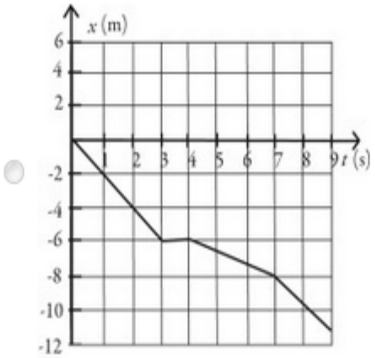
The function S(t) seems to be (negative) exponential. Its derivative will be negative exponential.

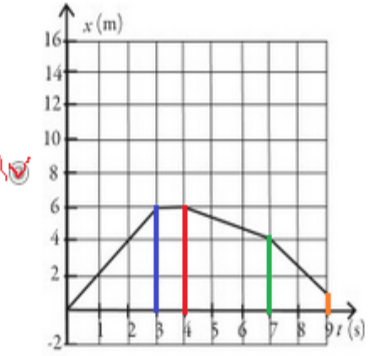
Item 6

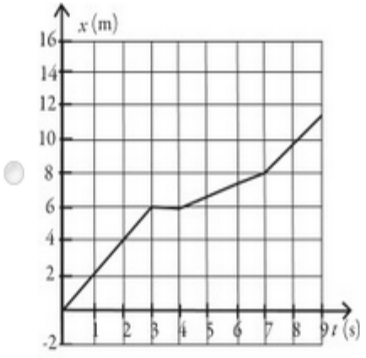
Part A

An object starts its motion with a constant velocity of 2.0 m/s toward the east. After 3.0 s, the object stops for 1.0 s. The object then moves toward the west a distance of 2.0 m in 3.0 s. The object continues traveling in the same direction, but increases its speed by 1.0 m/s for the next 2.0 s. Which graph below could represent the motion of this object?









Item 7

Part A

The position of an object is given by $x = at^3 - bt^2 + ct$, where $a = 4.1\ m/s^3$, $b = 2.2\ m/s^2$, $c = 1.7\ m/s$, and x and t are in SI units. What is the instantaneous acceleration of the object when $t = 1\ s$?

- [x] $20.2\ m/s^2$
- [ ] $24.2\ m/s^2$
- [ ] $16.2\ m/s^2$
- [ ] $28.3\ m/s^2$

$x(t) = at^3 - bt^2 + ct$

$v(t) = 3at^2 - 2bt + c$

$a(t) = 6at - 2b$

$a(1) = [6(4.1)(1)] - [(2)(2.2)]$

$a(1) = 24.6 - 4.4 = 20.2\ m/s^2$

Item 8

Part A

The velocity of an object as a function of time is given by $v(t) = 2.00\ \text{m/s} + (3.00\ \text{m/s}^2)\,t - (1.0\ \text{m/s}^3)\,t^2$.

- $-1.00\ \text{m/s}^2$
- $0.00\ \text{m/s}^2$
- $1.00\ \text{m/s}^2$
- $-5.00\ \text{m/s}^2$
- $-3.00\ \text{m/s}^2$

Determine the instantaneous acceleration of the object at time $t = 3.00$ s.

$v(t) = 2.00\ \text{m/s} + (3.00\ \text{m/s}^2)\,t - (1.0\ \text{m/s}^3)\,t^2$

$a(t) = 3 - 2t$

$a(3) = 3 - 3(2) = 6\ \text{m/s}^2$

Item 9

Part A

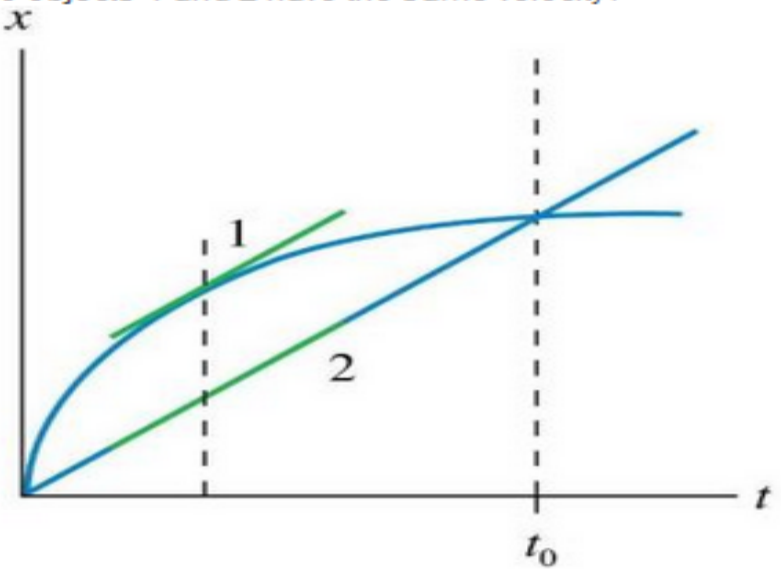
The slope at a point on a position-versus-time graph of an object is

- The distance traveled by the object to that point.
- I really have no idea.
- The object's acceleration at that point.
- The object's speed at that point.
- The object's velocity at that point.

Part A

When do objects 1 and 2 have the same velocity?

Item 10



- Never.
- At time t_0 and at some instant before time t_0.
- At some instant before time t_0.
- At some instant after time t_0.
- At time t_0.

Key note: The same velocity means the same slope.
The first dash line depicts this instance, which is before t_0