أوراق عمل الوحدة الثانية Line-Straight a in Motion الحركة في بعد واحد

تاريخ إضافة الملف على موقع المناهج: 2024-10-21 18:02:43

المزيد من مادة فيزياء:	ملفات ا كتب للمعلم ا كتب للطالب ا اختبارات الكترونية ا اختبارات ا حلول ا عروض بوربوينت ا أوراق عمل منهج انجليزي ا ملخصات وتقارير ا مذكرات وبنوك ا الامتحان النهائي ا للمدرس

التواصل الاجتماعي بحسب الصف الحادي عشر المتقدم

صفحة المناهج الإماراتية على فيسبوك					
المواد على تلغرام	التربية الاسلامية	اللغة العربية	اللغة الانجليزية	الرياضيات	

المزيد من الملفات بحسب الصف الحادي عشر المتقدم والمادة فيزياء في الفصل الأول

Motion in a Straight-Line Questions

1. A car travels north at 30.0 m/s for 10.0 min. It then travels south at 40.0 m/s for 20.0 min. What are the total distance the car travels and its displacement?

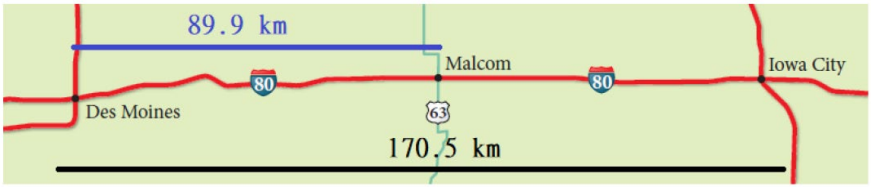
2. You ride your bike along a straight line from your house to a store 1000 m away. On your way back, you stop at a friend's house which is halfway between your house and the store.

a) What is your displacement?

b) What is the distance you have traveled?

3. Shikha's dorm room is located 0.25 miles from the Dairy Store. She walks from her room to the Dairy Store and then back to her room. Which of the following statements about her trip is true?

A. The distance is 0.50 miles, and the displacement is 0.50 miles.
B. The distance is 0.50 miles, and the displacement is 0.00 miles.
C. The distance is 0.00 miles, and the displacement is 0.50 miles.
D. The distance is 0.00 miles, and the displacement is 0.00 miles



4. **If we drive from Malcom to Des Moines and then go to Iowa City, what are the total distance and total displacement for this trip?**

	Distance	Displacement
A	80.6	260.4 West
B	260.4	80.6 East
C	80.6	260.4 East
D	260.4	80.6 West

5. **A car travels north at 30.0 m/s for 10.0 min. It then travels south at 40.0 m/s for 20.0 min. What are the total distance the car travels and its displacement?**

	Distance	Displacement
A	3.3×10^4	6.6×10^4 north
B	6.6×10^4	3.3×10^4 north
C	6.6×10^4	3.3×10^4 south
D	3.3×10^4	6.6×10^4 south

6. **Which of the following is true about distance and displacement?**

A. displacement cannot be zero
B. displacement magnitude is greater than the distance travelled by the object
C. displacement may or may not be equal to the distance
D. Distance is always greater than displacement

7. An electron moves in the positive *x*-direction a distance of 2.42 m in 2.91 x10^{-8} s, bounces off a moving proton, and then moves in the opposite direction a distance of 1.69 m in 3.43 x 10^{-8} s.

a) What is the average velocity of the electron over the entire time interval?

b) What is the average speed of the electron over the entire time interval?

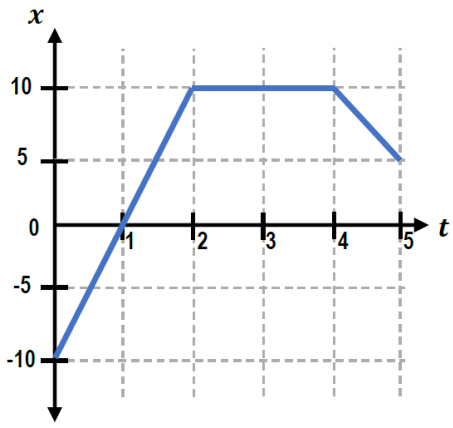
EXAMPLE: For the given position-time graph, calculate v_{avg}:

a) from **t=0** to **t=2s**

b) from **t=2** to **t=4s**

c) from **t=4** to **t=5s**

d) for the entire motion

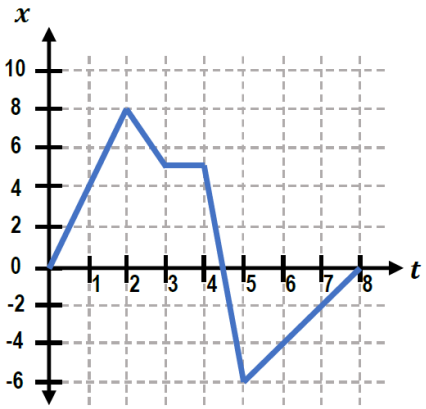


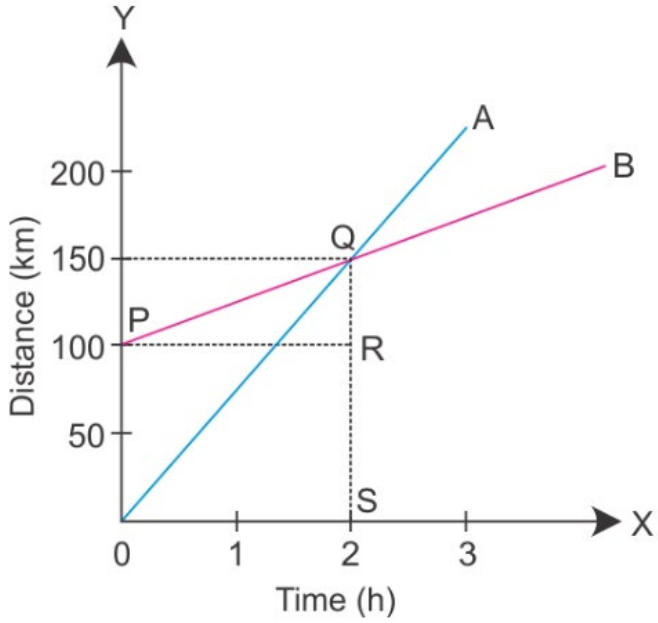
PRACTICE: The position-time graph for a moving box is shown below.

a) What is the box's velocity from 0 to 5s?

b) What is the box's velocity from 0 to 8s?

c) What is the box's velocity in the interval where it's moving fastest?





The given figure shows the distance-time graphs of two trains, which start moving simultaneously in the same direction, from the graphs, find:

i) How much B is ahead of A when motion starts?

ii) What is the speed of B?

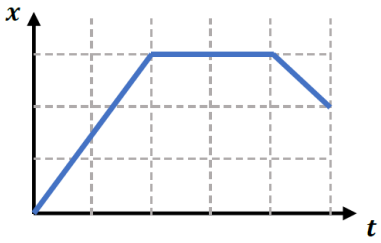
iii) When and where A will catch B?

iv) What is the difference in speeds of A and B?

CONCEPT: CURVED POSITION-TIME GRAPHS & ACCELERATION

- Position graph is **curved** (not straight lines) when the velocity is _____ (acceleration is **NOT** zero).

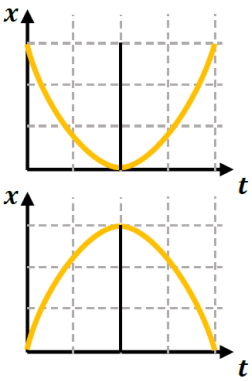
STRAIGHT POSITION GRAPH



- Straight lines → v = constant, a = 0

CURVED POSITION GRAPH

Left Side: Object _____



Right Side: Object _____

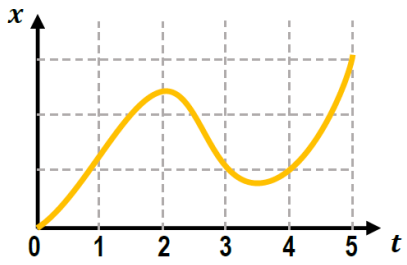
- Curving **UP** (Smiley ☺) → **[POSITIVE | NEGATIVE]** acceleration
- Curving **DOWN** (Frowny ☹) → **[POSITIVE | NEGATIVE]** acceleration

CONCEPT: POSITION-TIME GRAPHS & INSTANTANEOUS VELOCITY

- There are 2 different types of velocity you'll need to calculate in position-time graphs.

AVERAGE Velocity

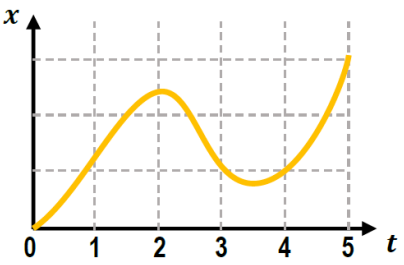
→ between *TWO* points



- $\vec{v}_{avg} = \frac{\Delta x}{\Delta t}$ = slope of line between 2 points

INSTANTANEOUS Velocity

→ at *ONE* point (instant)



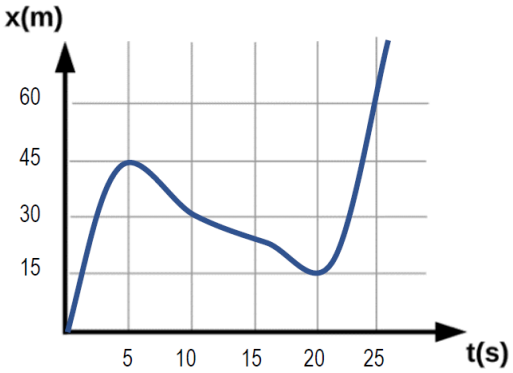
- $\vec{v}$ = slope of **tangent line** ⇒ line touches graph ONLY _____
  - Use an approximated line (best guess) if not given

EXAMPLE: Using the position-time graph for a moving object,

a) Calculate the object's velocity between t=10 & t=25

b) Calculate the object's velocity at t=10

c) Calculate the object's velocity at t=5



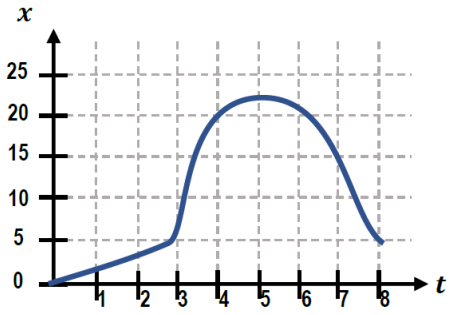
- $\vec{v} = 0$ at _____ & _____ of position graph.

PRACTICE: The position-time graph for a ball on a track is shown below.

a) What is the ball's velocity at t=4s?

b) At what time(s) is the ball approximately travelling at -10m/s?

c) From t = 3 to 7s, what is the sign of the acceleration?



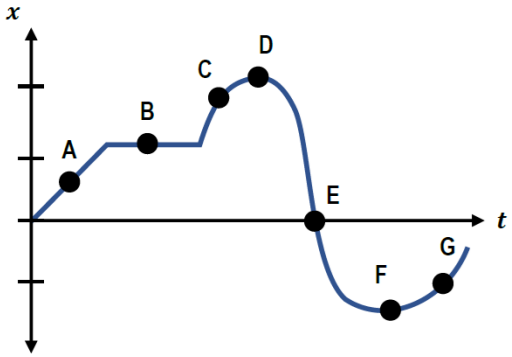
CONCEPT: CONCEPTUAL PROBLEMS WITH POSITION-TIME GRAPHS

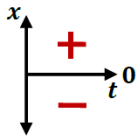
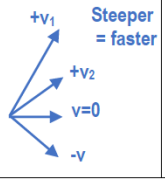
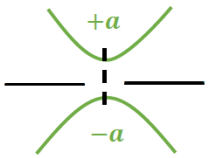
- You'll need to interpret position-time graphs to solve conceptual questions about position, velocity & acceleration.

EXAMPLE: The figure shows a position-graph for a moving object. At which lettered point(s):

1) is the object at the origin?
2) is the object the farthest away from the origin?
3) is the object moving forwards?
4) is the object moving backwards?
5) is the object at rest?
6) is the object's acceleration positive?
7) is the object's acceleration negative?

STEPS
1) Identify Variable: **[Position | Velocity (Speed) | Accel.]**
2) Identify Graph Feature: **[Value | Slope | Curvature]**
3) Identify Qualifier: **[+ | - | 0 | Up | Down | Sign Change | max. | min.]**
4) Interpret from Graph

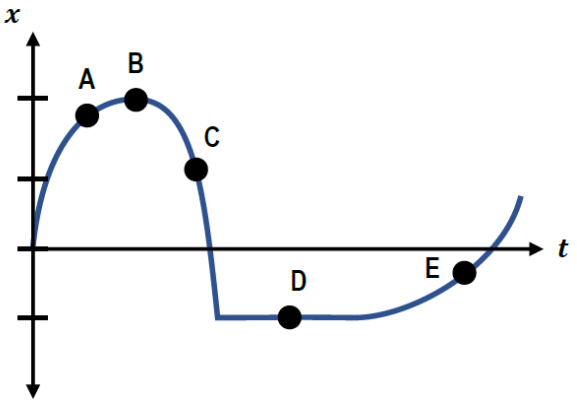


	Position (x)	Velocity (v) (or Speed)	Acceleration (a)
	Value	Slope	Curvature
X-T			

EXAMPLE: Using the position-time graph for a moving car, determine the lettered point(s) where the car:

1) is moving *fastest*?
2) is moving *slowest*?
3) turns around?
4) is speeding up?
5) is slowing down?

STEPS
1) Identify Variable: **[Position | Velocity (Speed) | Accel.]**
2) Identify Graph Feature: **[Value | Slope | Curvature]**
3) Identify Qualifier: **[+ | - | 0 | Up | Down | Sign Change | max. | min.]**
4) Interpret from Graph



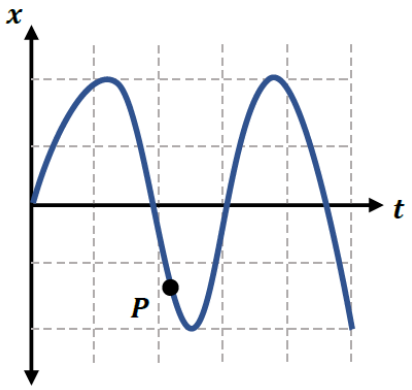
PRACTICE: The position of an object vibrating on a moving spring is represented by the diagram below. Which of the following answer choices is true of the velocity and acceleration at Point **P**?

(a) The velocity is **positive** and the acceleration is **positive**

(b) The velocity is **positive** and the acceleration is **negative**

(c) The velocity is **negative** and the acceleration is **positive**

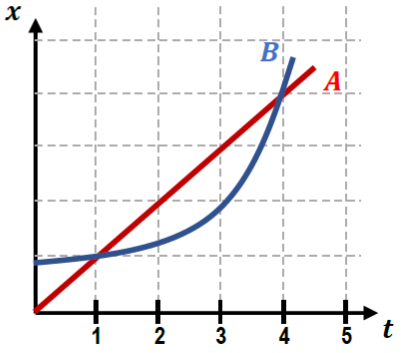
(d) The velocity is **negative** and the acceleration is **negative**



EXAMPLE: The figure shows the position-time graphs for two moving bicycles, labeled **A** and **B**.

(a) At what time(s) do the bicycles have the same position?

(b) At what time(s) do the bicycles have roughly the same velocity?



Average acceleration is defined as the ...

a) displacement change per time interval.

b) position change per time interval.

c) velocity change per time interval.

d) speed change per time interval.

An example of one-dimensional motion with constant acceleration is .....

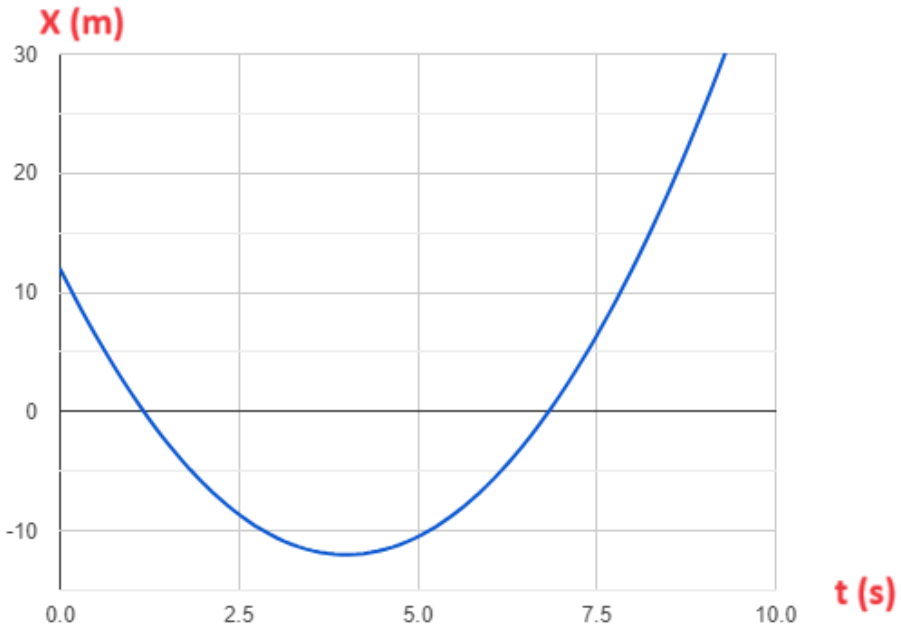
a) the motion of a car during a NASCAR race.

b) the Earth orbiting the Sun.

c) an object in free fall.

d) None of the above describe one dimensional motion with constant acceleration.

the position vector is given by $x(t) = a + bt + ct^2$, and it's represented by the graph shown below. where a = 12 m, b = - 12 m/s and c = 1.5 m/s^2

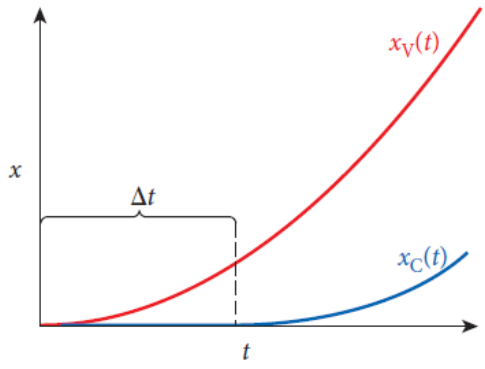


A- Calculate the velocity of the car at t = 6 Sec.

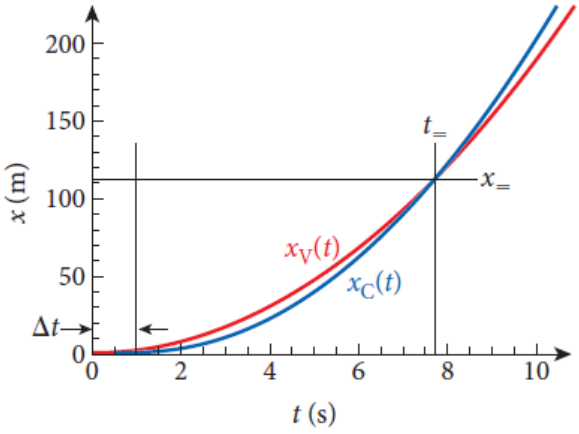
B- Estimate based on the graph the time when the car instantaneously stops

C- Find the average velocity of the car in the time interval (0 Sec – 9 Sec)

Two racing cars start from rest have the following x-t graph where A is enlarged for the first 4 s



A



B

Which of the following is NOT true?

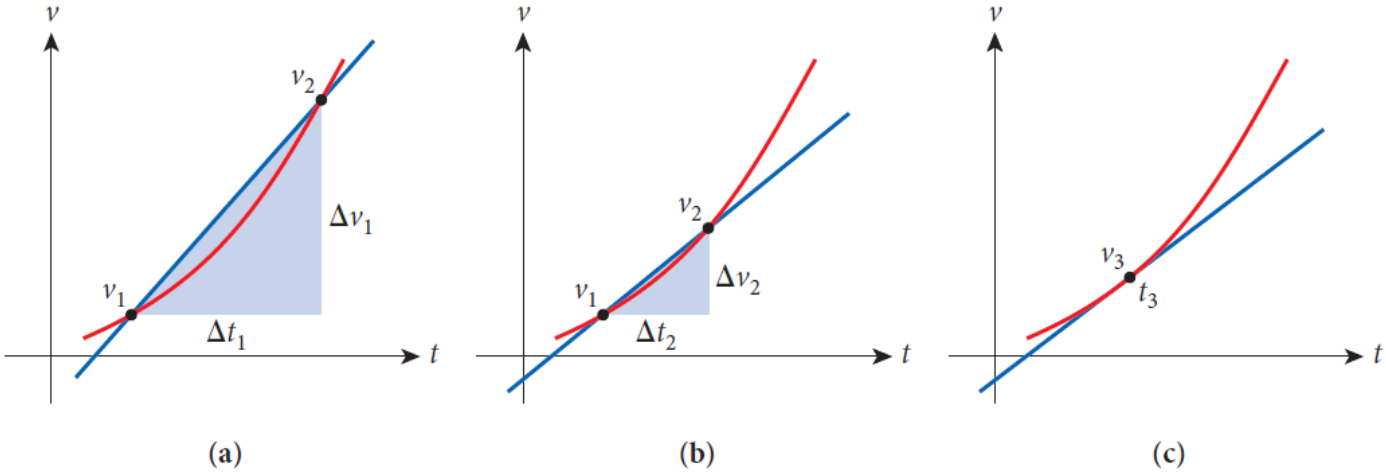
A. At time interval of fig A. the red car has greater acceleration than the blue car.

B. The two cars will meet after 112 m approximately.

C. the formula used to find the tome where the two cars meet is $t_= = \dfrac{\Delta t\sqrt{a_C}}{\sqrt{a_C} - \sqrt{a_V}}$

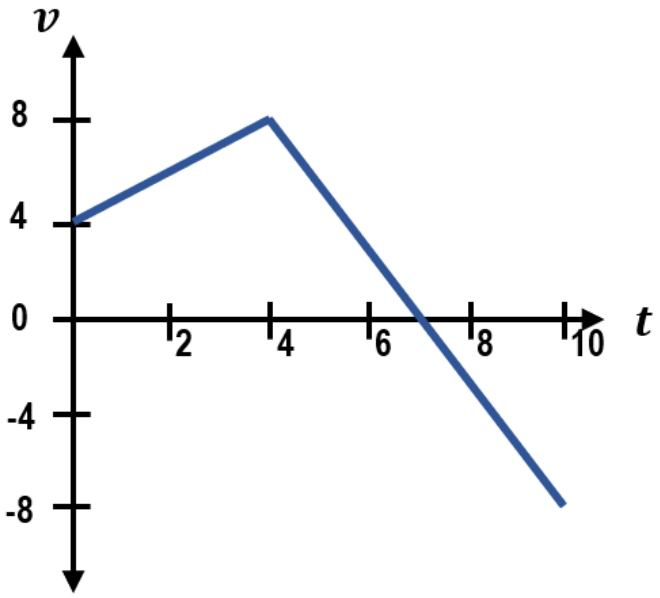
D. At time $t_=$ both cars will have the same acceleration.

Which of the following is true regarding the three diagrams?



A. Curve (a) and (b) can be used to find the instantaneous acceleration using time intervals
B. average acceleration time interval in graph (a) is larger than over time interval in graph (b)
C. average acceleration time interval in graph (b) is larger than over time interval in graph (a)
D. instantaneous acceleration can't be found using graph (c)

A moving box's motion is described by the velocity graph below. The box's initial position is x = 0.



(a) How far has the box moved at t = 4?

(b) What is the displacement of the box from t=4 to t=10?

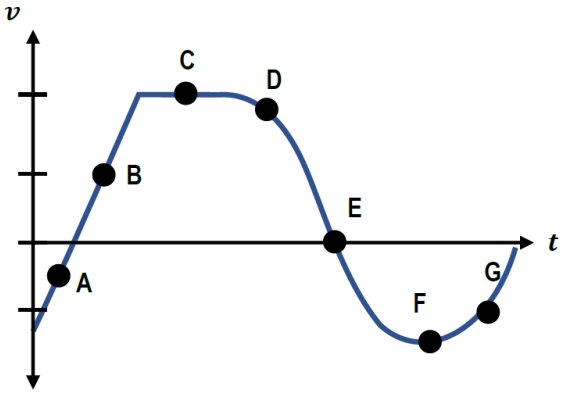
CONCEPT: CONCEPTUAL PROBLEMS WITH VELOCITY-TIME GRAPHS

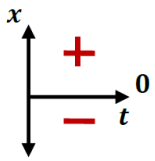
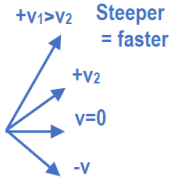
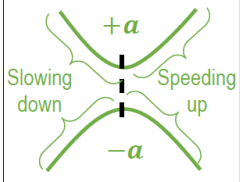
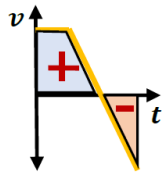
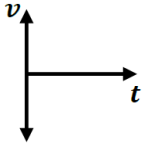
- You'll need to interpret velocity-time graphs to solve conceptual questions about position, velocity & acceleration.

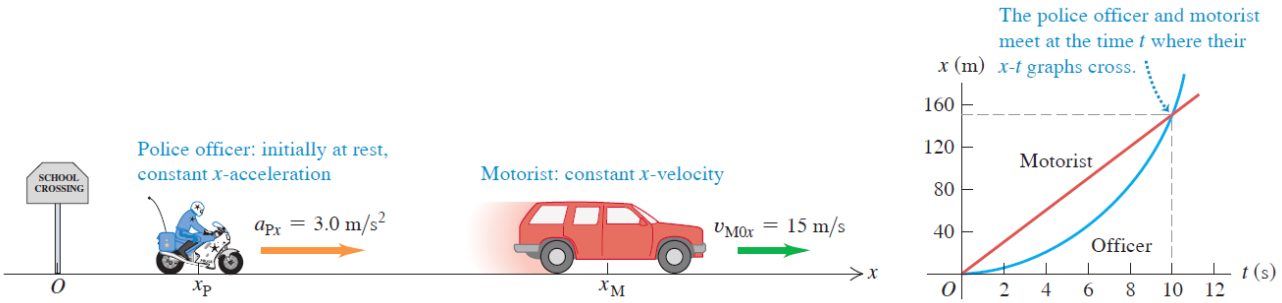
EXAMPLE: The figure shows the velocity graph for a moving box. At which lettered point(s):

1) is the box moving forwards?
2) is the box moving backwards?
3) is the box at rest?
4) is the box turning around?
5) is the box's acceleration positive?
6) is the box's acceleration negative?
7) is the box accelerating the fastest?
8) is the box speeding up?

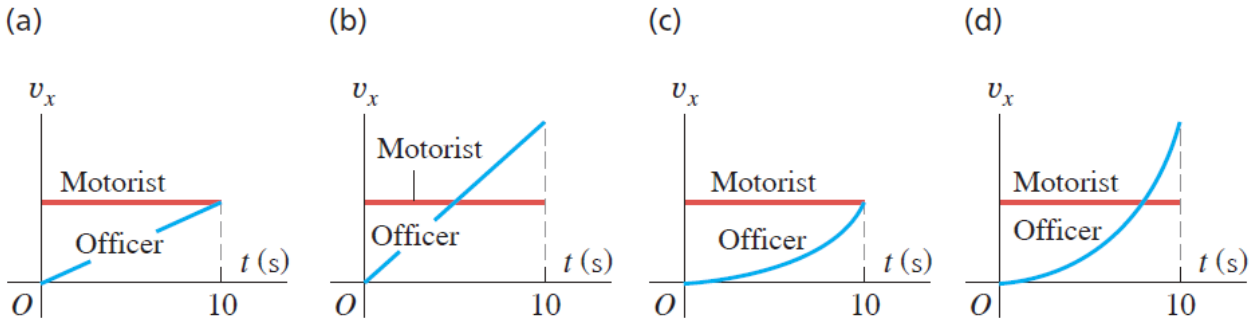
STEPS
1) Identify Variable: **[Position | Velocity (Speed) | Accel.]**
2) Identify Graph Feature: **[Value | Slope | Curvature]**
3) Identify Qualifier: **[+ | - | 0 | Up | Down | Sign Change | max. | min.]**
4) Interpret from Graph



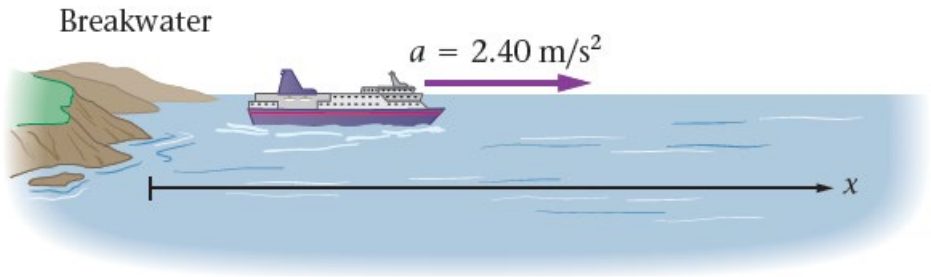
	Position (x) (or Displacement)	Velocity (v) (or Speed)	Acceleration (a)
	Value	**Slope**	**Curvature**
X-T			
	Area	**Value**	**Slope**
V-T			



Four possible v_x-t graphs are shown for the two vehicles. Which graph is correct?



A boat moves slowly inside a marina (so as not to leave a wake) with a constant speed of 1.50 m/s. As soon as it passes the breakwater, leaving the marina, it throttles up and accelerates at 2.40 m/s².



(a) How fast is the boat moving after accelerating for 5.00 s? **13.5 m/s**

(b) How far has the boat travelled in these 5.00 s? **37.5 m**

An object of unknown mass is initially at rest and dropped from a height h. It reaches the ground with a velocity v_1 The same object is then raised again to the same height h, but this time is thrown downward with velocity v_1 now reaches the ground with a new velocity V_2 . How is v_2 related to v_1?

A. $V_2 = V_1$
B. $V_2 = \sqrt{2}\, V_1$
C. $V_2 = 2V_1$
D. $V_2 = 4V_1$

A truck travelling due north at 20 m/s turns west and travels at the same speed. Then the change in velocity is

A. 40 m/s northwest

B. $20\sqrt{2}$ m/s northwest

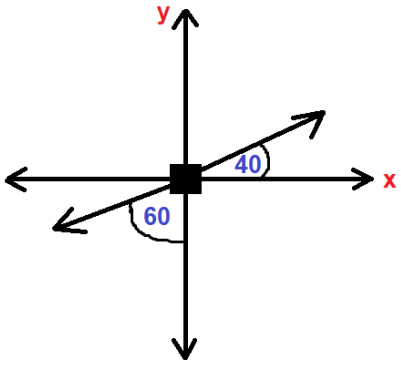
C. $20\sqrt{2}$ m/s southwest

D. 40 m/s southeast

A particle travels at 20.0 m/s north for 20.0 min and then it stops instantaneously and reverses the direction and travels at 25.00/s for 15.0 min. what is the particle's total displacement?

A. 150 m
B. 25 km
C. 2500 m
D. 1.5 km

The free body diagram below shows two forces acting on a mass. Which equation of the following represents the vector sum of the forces in N, on the x-axis?



A. $\sum F_x = 4 \cos 210\,^\circ + 6 \cos 40\,^\circ$

B. $\sum F_x = 4 \sin 60\,^\circ + 6 \cos 40\,^\circ$

C. $\sum F_x = -4 \cos 60\,^\circ + 6 \sin 40\,^\circ$

D. $\sum F_x = -4 \cos 60\,^\circ + 6 \cos 40\,^\circ$

The position of a particle moving along the *x*-axis is given by $x = (11 + 14t - 2.0t^2)$, where *t* is in seconds and *x* is in meters. What is the average velocity during the time interval from $t = 1.0$ s to $t = 4.0$ s?

The position of a particle moving along the *x*-axis is given by $x = 3.0t^2 - 2.0t^3$, where *x* is in meters and *t* is in seconds. What is the position of the particle when it achieves its maximum speed in the positive *x*-direction?

A particle moves according to the equation $x = 2t^2 - 5t + 6$, find average velocity in the first 3 s and instantaneous velocity at $t = 3$ s.

(A) 1 m/s, 7 m/s (B) 4 m/s, 3 m/s

(C) 2 m/s, 5 m/s (D) 3 m/s, 7 m/s

The position of an object as a function of time is given as $x = At^3 + Bt^2 + Ct + D$.

The constants are $A = 2.10\ m/s^3$, $B = 1.00\ m/s^2$, $C = -4.10\ m/s$, and $D = 3.00$ m.

a) What is the velocity of the object at $t = 10.0$ s?

b) At what time(s) is the object at rest?

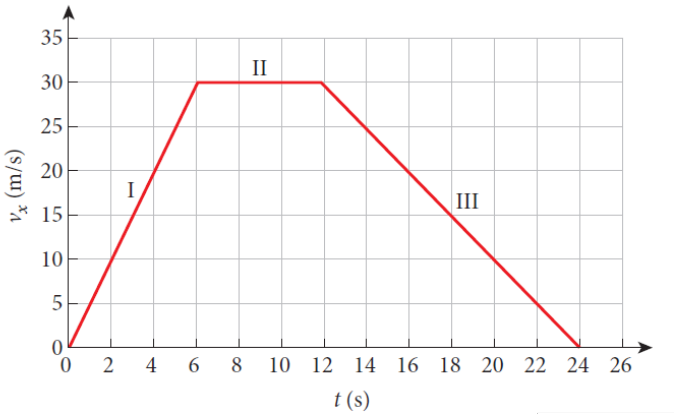
c) What is the acceleration of the object at $t = 0.50$ s?

Running on a 50-m by 40-m rectangular track, you complete one lap in 100 s. What is your average velocity for the lap?

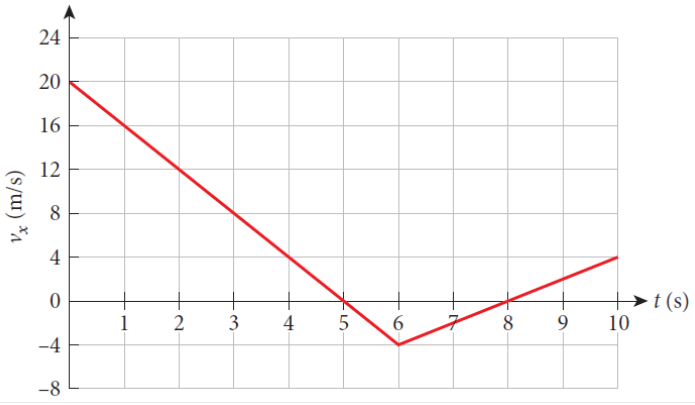
An electron moves in the positive *x*-direction a distance of 2.42 m in 2.91 x10^{-8} s, bounces off a moving proton, and then moves in the opposite direction a distance of 1.69 m in 3.43 x10^{-8} s.

a) What is the average velocity of the electron over the entire time interval?

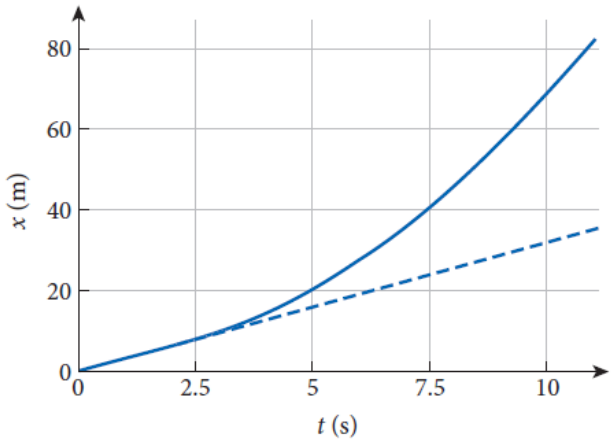
b) What is the average speed of the electron over the entire time interval?



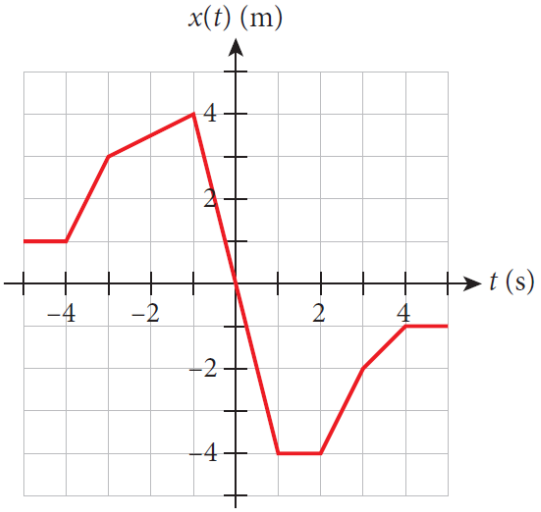
What is the Displacement of the car from *t* = 0 s to *t* = 24 s?



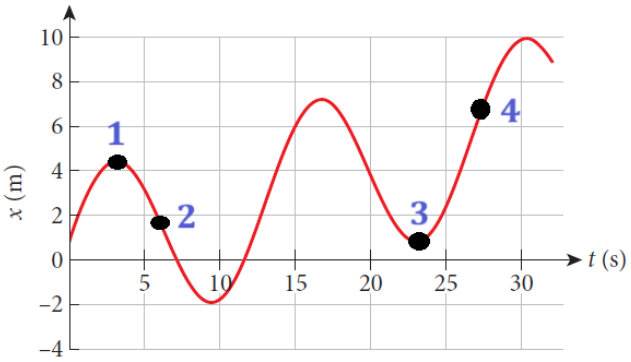
What is the Displacement of the car from *t* = 4 s to *t* = 9 s?



a) What is the value of the constant velocity of the car before 2.5 s? (Hint: The dashed blue line is the path the car would take in the absence of the acceleration.)
b) What is the velocity of the car at t = 7.5 s? Use a graphical technique
c) What is the value of the constant acceleration?



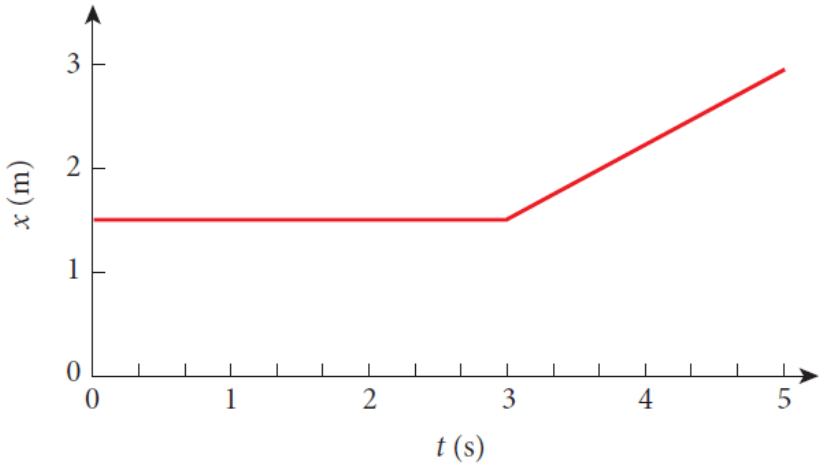
a) In which time interval does the particle have its maximum speed? What is that speed?
b) What is the average velocity in the time interval between –5 s and +5 s?
c) What is the average speed in the time interval between ⁻5 s and +5 s?
d) What is the ratio of the velocity in the interval between 2 s and 3 s to the velocity in the interval between 3 s and 4 s?
e) At what time(s) is the particle's velocity zero?



Which points where the velocity is zero and the points where the acceleration is zero.

	Velocity = 0	Acceleration = 0
A	1	3
B	2	4
C	1	4
D	3	3

2.12 The figure describes the position of an object as a function of time. Which one of the following statements is true?



a) The position of the object is constant.

b) The velocity of the object is constant.

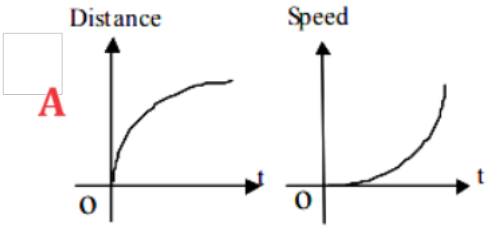
c) The object moves in the positive x-direction until $t = 3$ s, and then the object is at rest.

d) The object's position is constant until $t = 3$ s, and then the object begins to move in the positive x-direction.

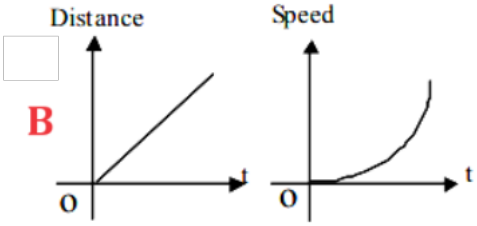
e) The object moves in the positive x-direction from $t = 0$ to $t = 3$ s and then moves in the negative x-direction from $t = 3$ s to $t = 5$ s.

Which of the following pairs of graphs shows the distance traveled versus time and the speed versus time for an object uniformly accelerated from rest (speeding up)?

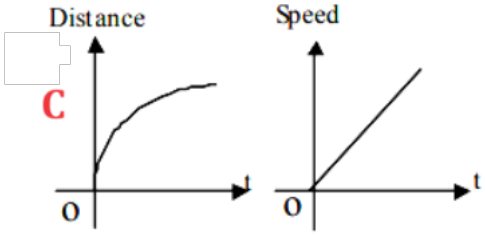
A



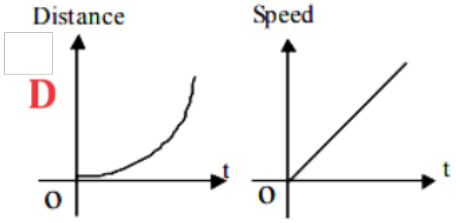
B



C



D



The velocity – time graph of a particle moving along a straight line is as shown in fig. The rate of acceleration and deceleration is constant and it is equal to 5 ms^{-2}. If the average velocity during the motion is 20 ms^{-1}, then The value of t is

Two train cars are on a straight, horizontal track. One car starts at rest and is put in motion with a constant acceleration of 2.00 m/s^2. This car moves toward a second car that is 30.0 m away. The second car is moving away from the first car and is traveling at a constant speed of 4.00 m/s.

a) How long will it take for the cars to collide

To find the time of collision, we set the positions equal:

$$x_A(t) = x_B(t)$$

$$t^2 = 30.0 + 4.00t$$

Rearranging gives:

$$t^2 - 4.00t - 30.0 = 0$$

$$t = 7.83 \text{ seconds}$$

a) Where will the cars collide?

$$x_A(t) = x_{iA} + v_{iA}t + \frac{1}{2}a_A t^2$$

$$x_A(t) = 0 + 0 \cdot t + \frac{1}{2}(2.00)t^2 = t^2 \text{ m}$$

$$x_A = (7.83)^2 = 61.3 \text{ m}$$

Two racing cars. Car A is rated to go from 0 to 26.82 m/s in 5.3 s, whereas Car B needs 7.0 s. Car B has a head start of 1.0 s.

a) How far down the track is Car B before Car A gets to start the race?

$$a_A = \frac{v_{fA} - v_{iA}}{t_A} = \frac{26.82 - 0}{5.3} \approx 5.06\,\text{m/s}^2$$

$$a_B = \frac{v_{fB} - v_{iB}}{t_B} = \frac{26.82 - 0}{7.0} \approx 3.83\,\text{m/s}^2$$

(1) Distance traveled by Car B during the head start

During the head start of $1.0\,\text{s}$, Car B travels a distance given by:

$$d_B = v_{iB}t + \frac{1}{2}a_B t^2$$

Where $v_{iB} = 0$:

$$d_B = 0 \cdot 1.0 + \frac{1}{2}a_B(1.0)^2 = \frac{1}{2}(3.83)(1.0^2) \approx 1.915\,\text{m}$$

---

b) At what time does Car A catch Car B?

Position of Car A (starting from $t = 0$):

$$x_A(t) = \frac{1}{2}a_A t^2$$

Where t is the time after Car A starts (note t starts at 0 when Car A starts).

Position of Car B (after Car A starts, with a 1-second head start):

$$x_B(t) = d_B + \frac{1}{2}a_B(t+1)^2$$

$$x_A(t) = x_B(t)$$

$$\frac{1}{2}a_A t^2 = d_B + \frac{1}{2}a_B(t+1)^2$$

$$\frac{1}{2}(5.06)t^2 = 1.915 + \frac{1}{2}(3.83)(t+1)^2$$

$$(t+1)^2 = (t+1)(t+1)$$

$$\boxed{t^2 + 2t + 1}$$

$$2.53t^2 = 1.915 + 1.915t + 1.915t^2$$

t = 3.91

c) How far away from the start are they when this happens?

Now, substituting $t = 3.91\,\text{s}$ back into the equation for Car A:

$$x_A(3.91) = \frac{1}{2}a_A(3.91)^2 = \frac{1}{2}(5.06)(3.91)^2$$

Calculating:

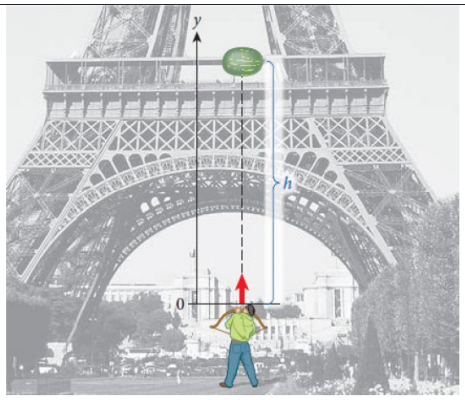
$$x_A(3.91) = \frac{1}{2}(5.06)(15.29) \approx \frac{1}{2}(77.45) \approx 38.73\,\text{m}$$

(Assume constant acceleration for each car during the race.)

Suppose you decide to drop a melon from rest from the first observation platform of the Eiffel Tower. **The initial height *h*** from which the melon is released is **58.3 m** above the head of your Friend Hamad, who is standing on the ground right below you. At the same instant you release the melon, Hamad shoots an arrow straight up with **an initial velocity** of **25.1 m/s.**

(a) How long after you drop the melon will the arrow hit it?

(b) At what height above Hamad's head does this collision occur?



$$y_a(t_c) = y_m(t_c).$$

$$h - \tfrac{1}{2}gt_c^2 = v_{a0}t_c - \tfrac{1}{2}gt_c^2$$

$$h = v_{a0}t_c \Rightarrow$$

$$t_c = \frac{h}{v_{a0}}.$$

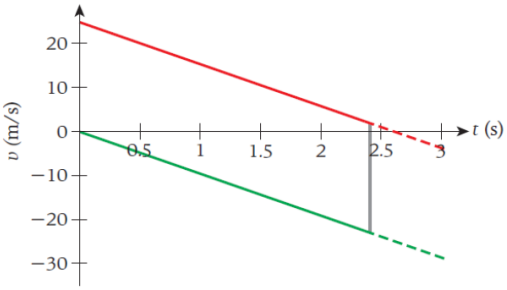
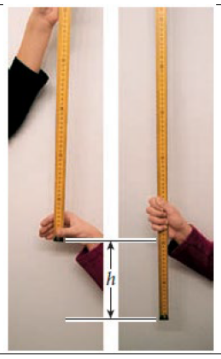


FIGURE 1.28 Velocities of the arrow (red curve) and melon (green curve) as a function of time.

If the meter stick falls 0.20 m before you catch it, **what is your reaction time?**



$y = y_0 + v_{y0}t - \frac{1}{2}gt^2$.

With $h = y_0 - y$ and $v_0 = 0$

$y = y_0 - \frac{1}{2}gt^2$

$\Rightarrow h = \frac{1}{2}gt^2$

$\Rightarrow t = \sqrt{\frac{2h}{g}}$