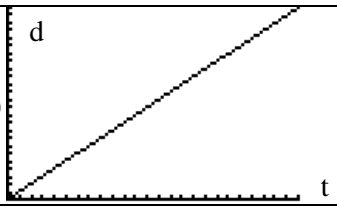
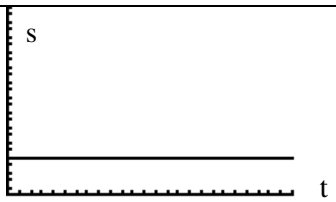
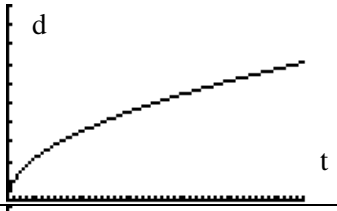
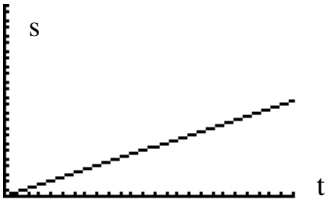
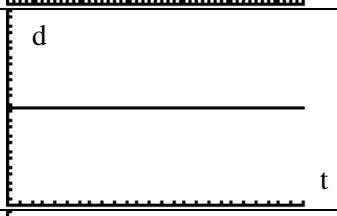
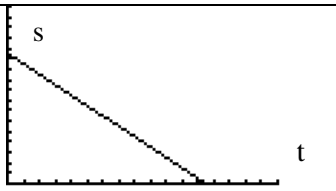
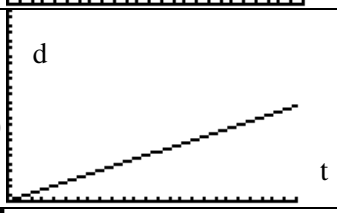
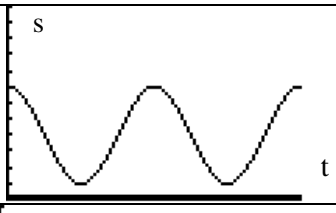
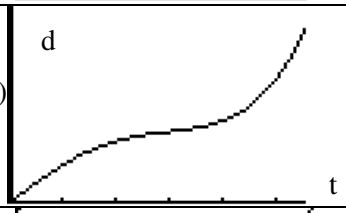
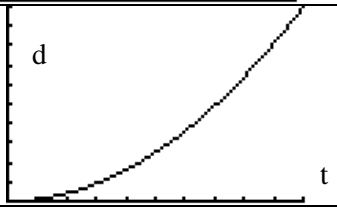
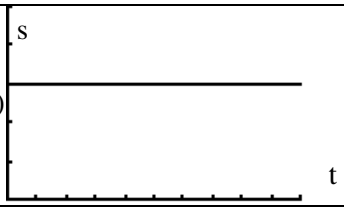
MATCH THE "MOTION" WITH THE GRAPH

For each example in the first column match:
A "distance – time" graph (Column 2) and
A "speed – time" graph (Column 3)

(1) Standing still	(A) 	(G) 
(2) Walking at a constant speed	(B) 	(H) 
(3) Running at a constant speed	(C) 	(I) 
(4) Running at an increasing speed	(D) 	(J) 
(5) Running at a decreasing speed	(E) 	(K) 
(6) Jogging and walking, alternately	(F) 	(L) 

Identify if Average, Close to Instant or Instant?

1. Some road tolls in the U.S. give speeding tickets based on the time it takes you to travel between exits.
2. A police officer pulls you over for speeding since her radar gun displays 130 km/hr.
3. Canada's population grew at a rate of 0.869% from 2006 to 2007.
4. Roy Halliday's fast ball was measured to have a velocity of 152 km/h.
5. Your parents kept a growth chart from the time you were 1 until you were 5 years old. They have calculated that your growth rate in that period was 9 cm/year.
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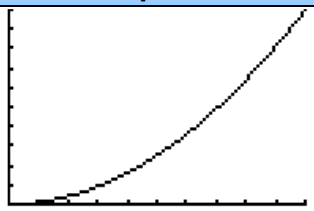
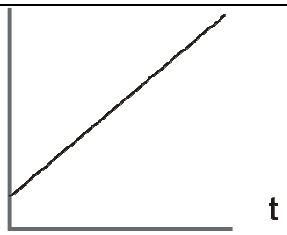
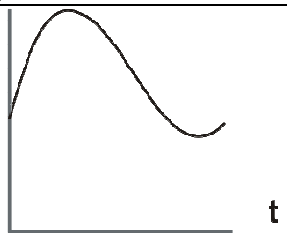
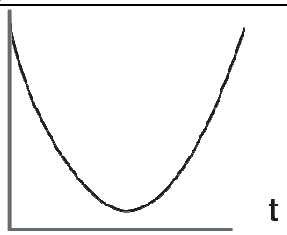
7. Water is being poured into a container. The rate in which the water level increases between 0 and 5 seconds of the pour is 7 mm/sec.
8. A CO_2 probe measures the rate of increase of atmospheric CO_2. The probe reads an increase of 1.7 x 10-8 ppm/sec.

Ch… Ch… Changes

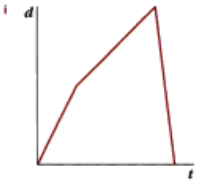
- Circle the rate of change as zero, constant, or changing for each graph.
- Match the graphs with the descriptions given on the right.
- Be prepared to explain your reasoning.

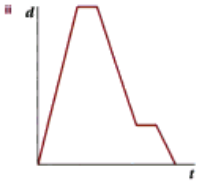
Graphs	Description
A  Rate of Change: zero constant changing	1. A grade 12 student's height over the next 12 months.
B  Rate of Change: zero constant changing	2. Money deposited on your 12th birthday grew slowly at first, then more quickly.
C  Rate of Change: zero constant changing	3. Andrea walks quickly, slows to a stop, and then speeds up until she is travelling at the same speed as when she started.
D  Rate of Change: zero constant changing	4. Over a one-month period the rate of growth for a sunflower is constant.
E  Rate of Change: zero constant changing	5. Clara walks quickly and then slows to a stop. She then walks quickly back and slows to a second stop. Clara then walks at a pace that is a little slower than when she started.

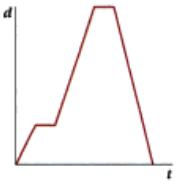
Reading and Interpreting Graphs

1.

These graphs show three different journeys. Match the graph with the description.

i 

ii 

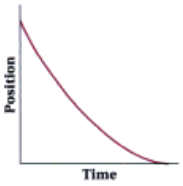
iii 

a a constant speed with a stop along the way and at the shops
b a constant speed to and from the shops with a stop on the way home
c a speed decrease part way through the trip to the shops and a constant speed home

2.

These two graphs show an object moving in the negative direction, that is, back towards the zero position. Which object starts slowly and then increases in speed?

A 

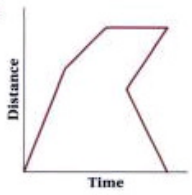
B 

3.

Why are these graphs not possible?

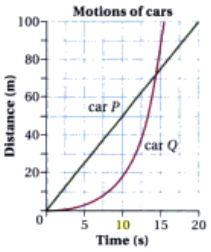
a 

b 

c 

4.

a What is the speed of car P?
b When do the two cars meet?
c How far from the zero position do they meet?
d At what time are the instantaneous speeds of both cars the same? How do you know?



5.

The graph shows the number of people at a bus stop in the morning.

a How many people were at the bus stop at 8:00 am?
b i When did the first bus arrive?
ii Did all people get on? Explain.
c How many people caught the fourth bus?
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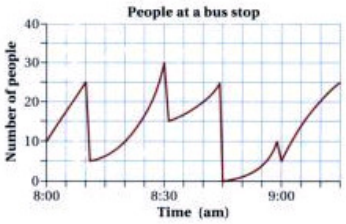
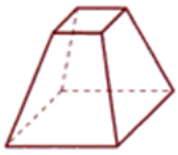
e Suppose the next bus arrives at 9:25 am. Approximately how many people would be waiting at the bus stop, assuming they keep arriving at the same rate?



6.

Each of these containers is filled with water through an opening at the top. Graph the water level in the container as it is filled at a steady rate.

a 

b 

c 

d 

MATCH THE "MOTION" WITH THE GRAPH ANSWERS

For each example in the first column match:
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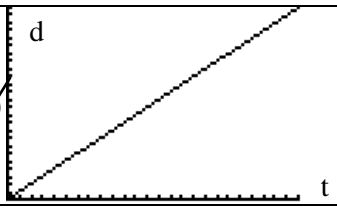
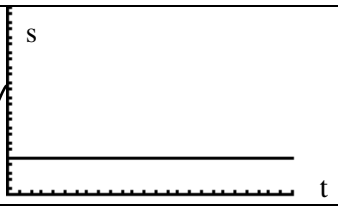
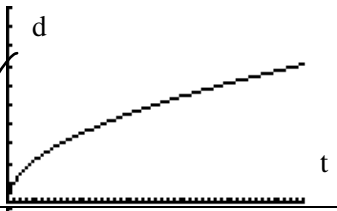
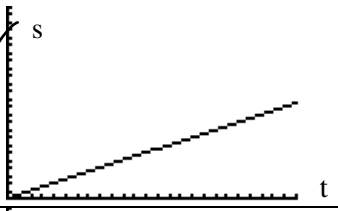
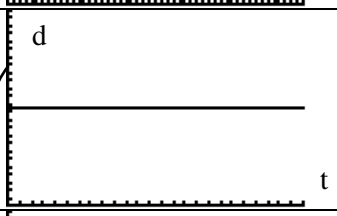
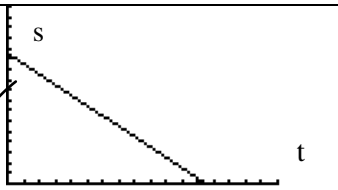
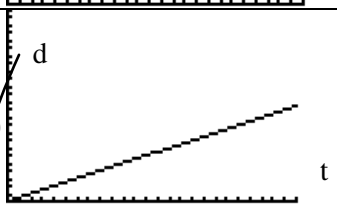
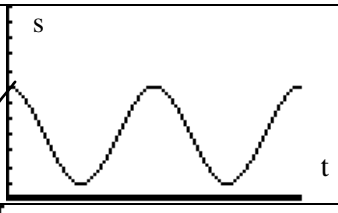
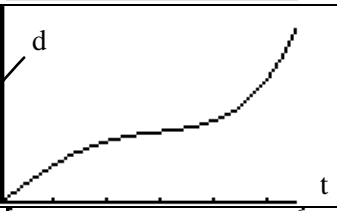
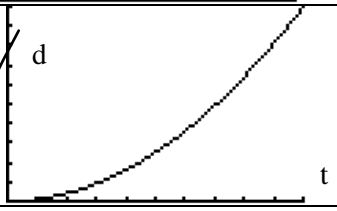
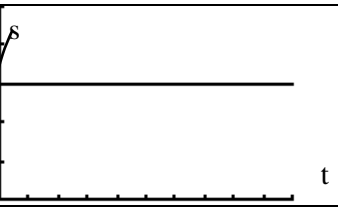
(1) Standing still C, K	(A) 	(G) 
(2) Walking at a constant speed D, G	(B) 	(H) 
(3) Running at a constant speed A, L	(C) 	(I) 
(4) Running at an increasing speed F, H	(D) 	(J) 
(5) Running at a decreasing speed B, I	(E) 	(K) 
(6) Jogging and walking, alternately E, J	(F) 	(L) 

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2. A police officer pulls you over for speeding since her radar gun displays 130 km/hr. close inst
3. Canada's population grew at a rate of 0.869% from 2006 to 2007. ave
4. Roy Halliday's fast ball was measured to have a velocity of 152 km/h. inst
5. Your parents kept a growth chart from the time you were 1 until you were 5 years old. They have calculated that your growth rate in that period was 9 cm/year. ave
6. In 1996, Hurricane Bertha had wind gusts up to185 km/h. inst
7. Water is being poured into a container. The rate in which the water level increases between 0 and 5 seconds of the pour is 7 mm/sec. ave
8. A CO_2 probe measures the rate of increase of atmospheric CO_2. The probe reads an increase of 1.7 x 10-8 ppm/sec. inst

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ANSWERS

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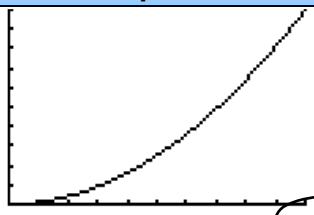
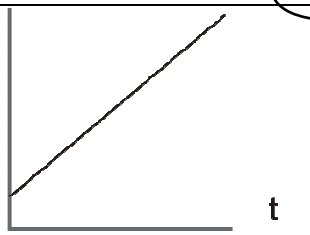
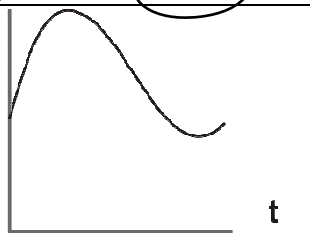
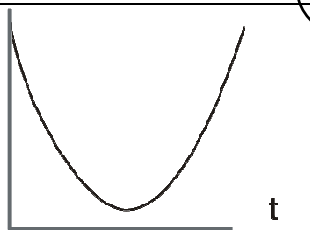
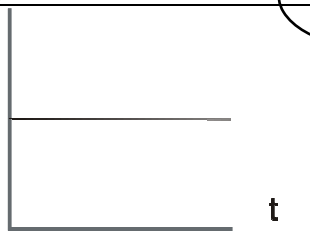
A  Rate of Change: zero constant changing	1. A grade 12 student's height over the next 12 months. E
B  Rate of Change: zero constant changing	2. Money deposited on your 12th birthday grew slowly at first, then more quickly. A
C  Rate of Change: zero constant changing	3. Andrea walks quickly, slows to a stop, and then speeds up until she is travelling at the same speed as when she started. D
D  Rate of Change: zero constant changing	4. Over a one-month period the rate of growth for a sunflower is constant. B
E  Rate of Change: zero constant changing	5. Clara walks quickly and then slows to a stop. She then walks quickly back and slows to a second stop. Clara then walks at a pace that is a little slower than when she started. C

Reading and Interpreting Graphs

ANSWERS

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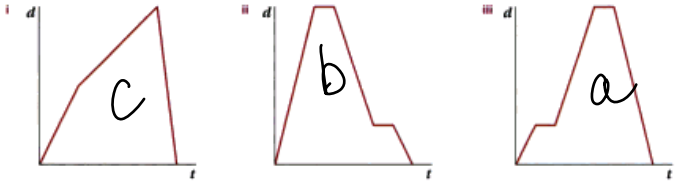
These graphs show three different journeys. Match the graph with the description.



a a constant speed with a stop along the way and at the shops
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c a speed decrease part way through the trip to the shops and a constant speed home

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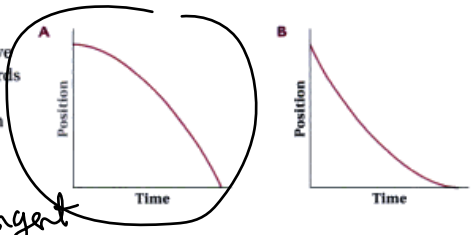
These two graphs show an object moving in the negative direction, that is, back towards the zero position. Which object starts slowly and then increases in speed?



look at slopes of tangent
steep = fast
shallow = slow

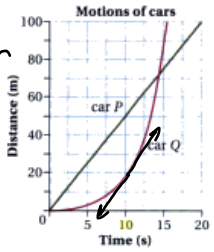
3.

Why are these graphs not possible?

can't be in 2 places at the same time

4.

a What is the speed of car P?
b When do the two cars meet? ~14 sec
c How far from the zero position do they meet? ~70m
d At what time are the instantaneous speeds of both cars the same? How do you know?



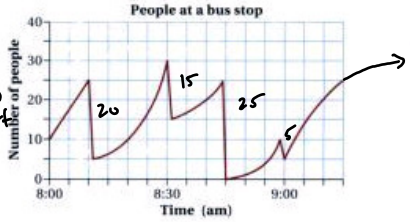
a) $\frac{\text{rise}}{\text{run}} = \frac{100}{20} = 5\,m/s$

d) same tangent slope at about $t = 10$

5.

The graph shows the number of people at a bus stop in the morning.

a How many people were at the bus stop at 8:00 am? 10
b i When did the first bus arrive? 8:10
ii Did all people get on? Explain. 5 left
c How many people caught the fourth bus? 5
d How many people caught a bus between 8:00 am and 9:00 am? 65
e Suppose the next bus arrives at 9:25 am. Approximately how many people would be waiting at the bus stop, assuming they keep arriving at the same rate? 30



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Each of these containers is filled with water through an opening at the top. Graph the water level in the container as it is filled at a steady rate.