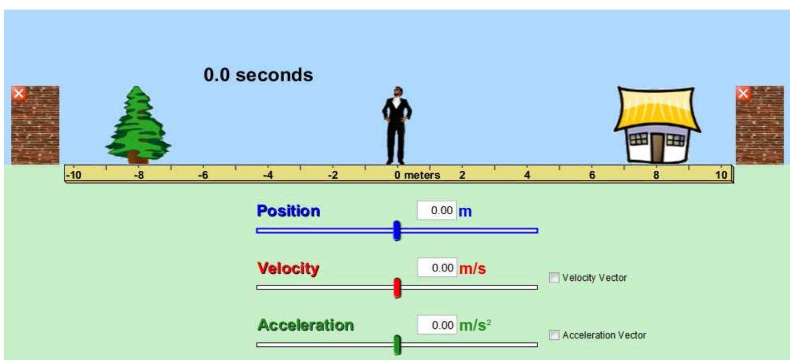
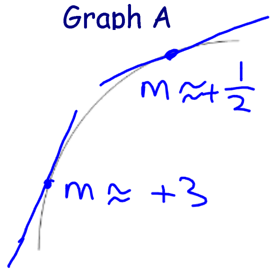
6.2 Graphs &  (RoC)

The Moving Man [JAR] click



Nov 27-2:14 PM

Graph A



Distance vs. Time

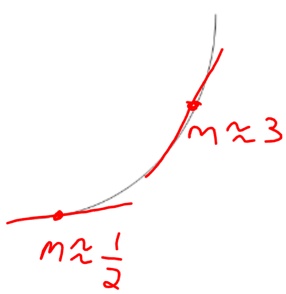
$v > 0$
$a < 0$

velocity		
The slopes of tangents to this graph are:	+	-
The rate of change of $f(x)$ is:	+	-
The graph of $f(x)$ is: (means y values are...)	increasing	decreasing
The velocity (for d vs t graph) is	+	-

acceleration		
The slopes of the tangents are:	more positive?	less positive?
	increasing	decreasing
The RoC of the slopes of the tangents is:	+	-
The graph of $f(x)$ is:	opens up	opens down
	concave up	concave down
The acceleration (for d vs t graph) is	+	-

speeding up or slowing down?		
The slopes of tangents are	getting steeper	getting flatter
The speed (for d vs t graph) is	increasing	decreasing

Graph B



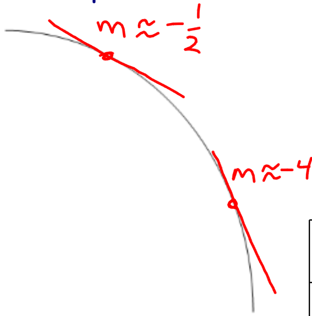
$v > 0$
$a > 0$

velocity		
The slopes of tangents to this graph are:	+	-
The rate of change of $f(x)$ is:	+	-
The graph of $f(x)$ is: (means y values are...)	increasing	decreasing
The velocity (for d vs t graph) is	+	-

acceleration		
The slopes of the tangents are:	more positive?	less positive?
	increasing	decreasing
The RoC of the slopes of the tangents is:	+	-
The graph of $f(x)$ is:	opens up	opens down
	concave up	concave down
The acceleration (for d vs t graph) is	+	-

speeding up or slowing down?		
The slopes of tangents are	getting steeper	getting flatter
The speed (for d vs t graph) is	increasing	decreasing

Graph C



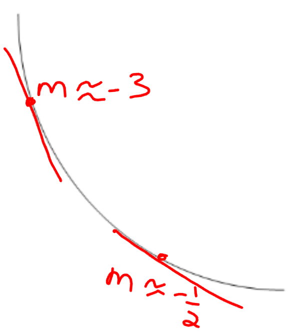
velocity		
The slopes of tangents to this graph are:	+	-
The rate of change of $f(x)$ is:	+	-
The graph of $f(x)$ is: (means y values are...)	increasing	decreasing
The velocity (for d vs t graph) is	+	-

acceleration		
The slopes of the tangents are:	less negative?	more negative?
	increasing	decreasing
The RoC of the slopes of the tangents is:	+	-
The graph of $f(x)$ is:	opens up	opens down
	concave up	concave down
The acceleration (for d vs t graph) is	+	-

$v < 0$
$a < 0$

speeding up or slowing down?		
The slopes of tangents are	getting steeper	getting flatter
The speed (for d vs t graph) is	increasing	decreasing

Graph D



velocity		
The slopes of tangents to this graph are:	+	-
The rate of change of $f(x)$ is:	+	-
The graph of $f(x)$ is: (means y values are...)	increasing	decreasing
The velocity (for d vs t graph) is	+	-

acceleration		
The slopes of the tangents are:	less negative?	more negative?
	increasing	decreasing
The RoC of the slopes of the tangents is:	+	-
The graph of $f(x)$ is:	opens up	opens down
	concave up	concave down
The acceleration (for d vs t graph) is	+	-

$v < 0$
$a > 0$

speeding up or slowing down?		
The slopes of tangents are	getting steeper	getting flatter
The speed (for d vs t graph) is	increasing	decreasing

Nov 28-10:01 AM

Application: Displacement, Velocity and Acceleration

Displacement: describes the position of an object relative to an origin.
ex. h(t), s(t), d(t)

Velocity, v(t):the RoC of displacementIt describes how fast an object is moving (value) AND the direction of movement (sign).
Note: Speed = |v| (no direction)

Acceleration, a(t): the RoC of velocity It describes how the velocity of an object is changing.
Positive acceleration is to the right (on a number line) or up.
Negative acceleration is to the left or down.

To determine whether an object is speeding up or slowing down you need information about BOTH its velocity and its acceleration.

v < 0 a < 0 v > 0 a > 0

-skydives

SPEEDING UP

- apple falling from tree
- going forward on the gas

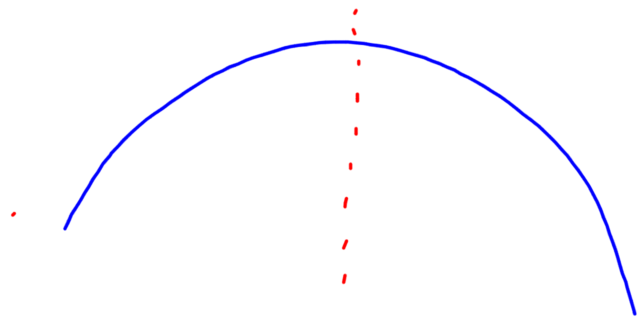
SLOWING DOWN

v < 0 a > 0 v > 0 a < 0

- roc-ketship landing
- on the way down bouncing on trampoline

- drive forward & hitting brake
- puck sliding on ice
- throwing a roc up in the air (going up)

	velocity	acceleration	
speeding up	positive	positive	$a \cdot v > 0$
	negative	negative	
slowing down	positive	negative	$a \cdot v < 0$
	negative	positive	

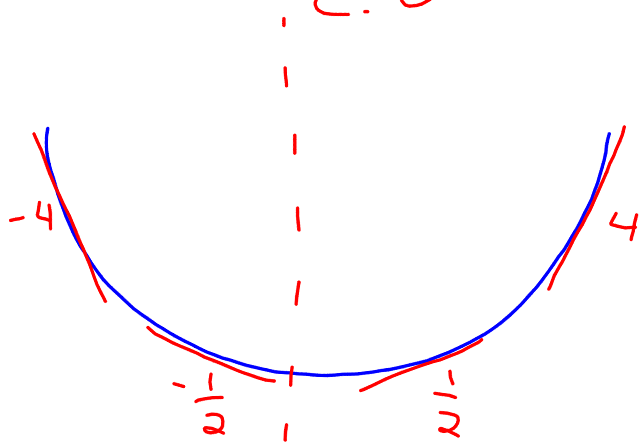


C.D.

$v > 0$ $v < 0$

$a < 0$ $a < 0$

C.U.

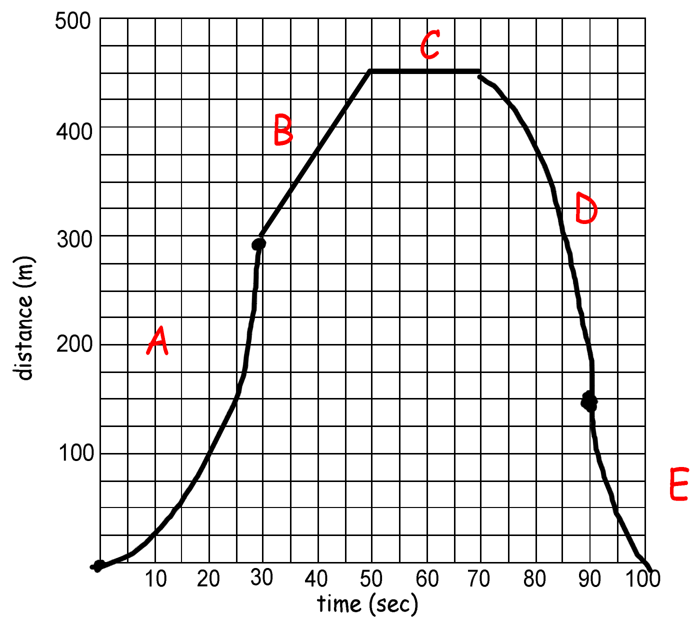


$v < 0$ $v > 0$

$a > 0$ $a > 0$

Nov 29-2:03 PM

Ex. 1
Describe what is happening with respect to rates of change, velocity, speed, acceleration etc. for each section of the following distance vs. time graph. Calculate values where possible.



Section	Slopes of Tangents	Velocity v(t)	Speed	Acceleration a(t)
A	- positive - increasing	- positive - increasing	- increasing - speeding up v(t) a(t) > 0	- positive
B	- positive - constant $m = \frac{450-300}{45-25}$ $m = 7.5m/s$	- constant 7.5 m/s	- constant 7.5 m/s	0
C	- constant = 0	0	0	0
D	- negative - decreasing (more neg)	- negative - decreasing (more neg)	- increasing v(t) a(t) > 0 -Speeding up	- negative
E	- negative - increasing (less neg)	- negative - increasing	- decreasing - slowing down v(t) a (t) < 0	- positive

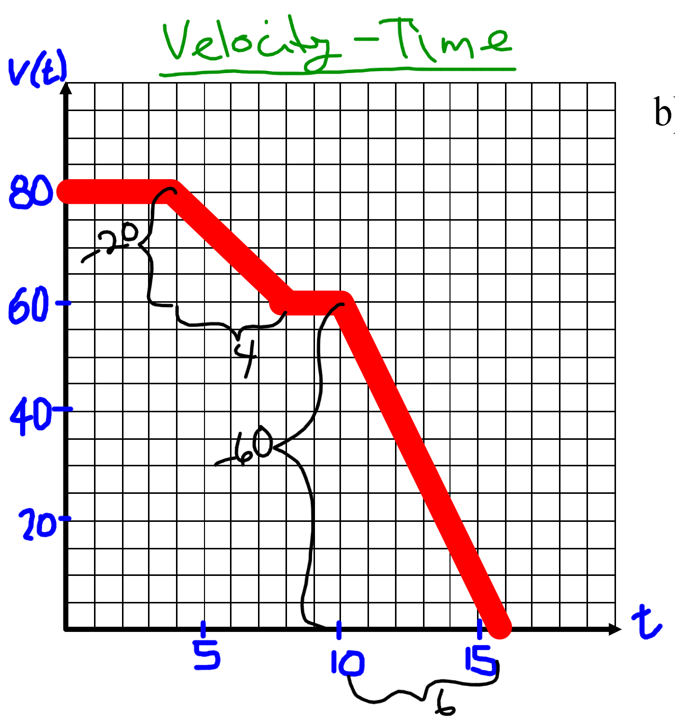
Nov 27-3:47 PM

Ex. 2 Sarah is driving at a speed of 80 km/h on Dunrobin Rd. for 4 minutes. She approaches the town of Dunrobin and starts to slow down at a constant rate for the next 4 minutes. She then travels at 60km/h for 2 minutes. She notices WCSS and slows down at a faster rate and comes to a stop 6 minutes later.

a) Sketch a graph of speed vs. time

b) Determine Sarah's average rate of change for each section of the graph.

$$a = \frac{\text{velocity}}{\text{time}} \Rightarrow \frac{km/h}{min} \Rightarrow \frac{km}{h \cdot min}$$



b)

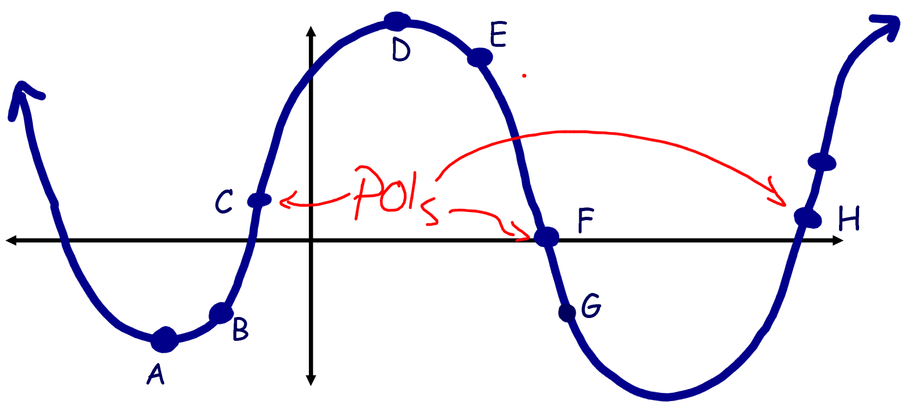
Part	$\frac{\Delta speed}{\Delta time}$
A	0
B	$\frac{-20}{4} = -5 \frac{km}{h \cdot min}$
C	0
D	$\frac{-60}{6} = -10 \frac{km}{h \cdot min}$

	position (y/position)	velocity (slopes of tangents)	acceleration (Rate of Change of Slopes of Tangent)
positive	above x-axis	slopes up from left to right	Concave up
zero	on x-axis	extrema Max or min	? Point of Inflection ?
negative	below x-axis	slopes down from left to right	concave down

Change

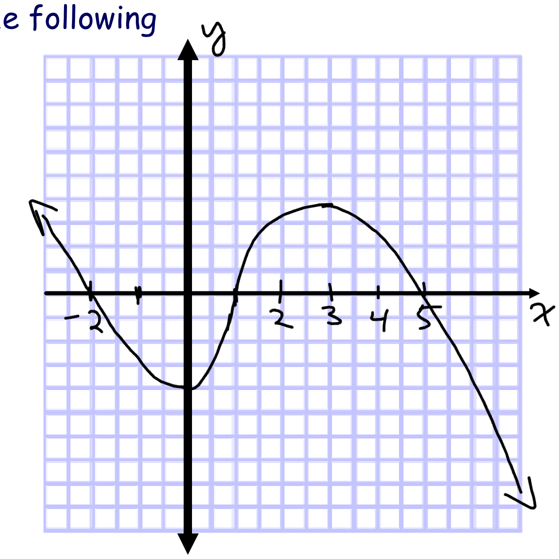
Ex: 3 State if the point indicates positive, zero or negative for position, slopes of tangents and RoC of slopes of tangents

	A	B	C	D	E	F	G	H
y	-	-	+	+	+	0	-	+
m_{tan}	0	+	+	0	-	-	-	+
RoC of m_{tan}	+	+	0	-	-	0	+	0



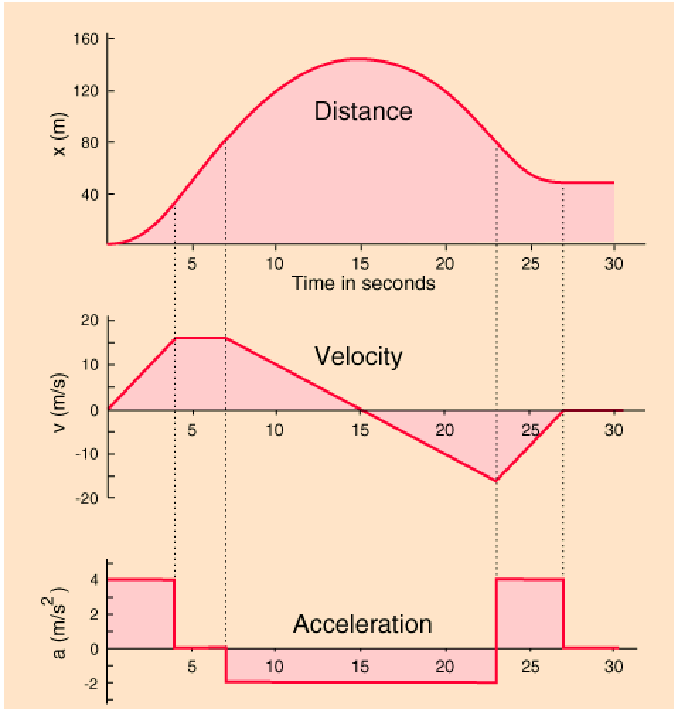
Ex: 4 Draw a graph with the following properties:

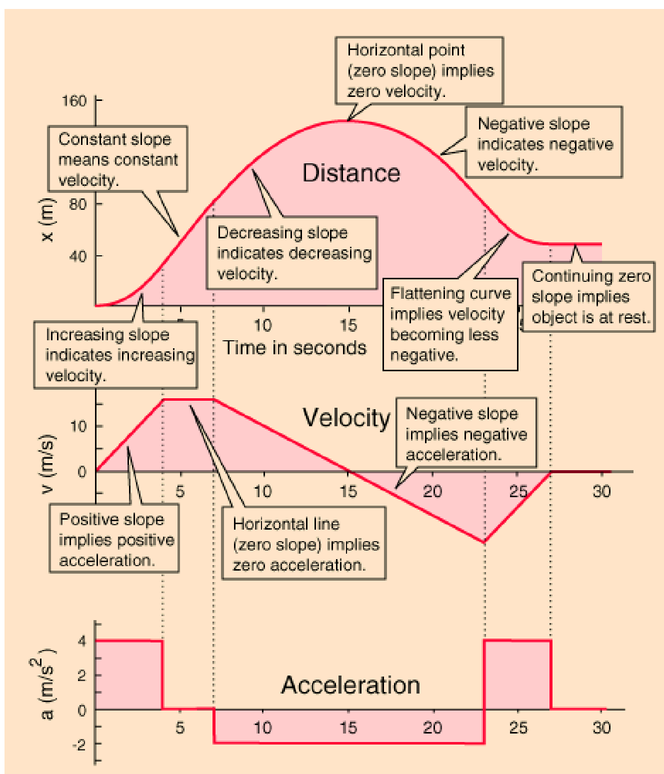
	y(x)	m_{tan}(x)
x<-2	+	-
-2<x< 0	-	-
0 <x < 1	-	+
1 < x < 3	+	+
3 < x < 5	+	-
x>5	-	-



don't worry the 'y'

Nov 29-8:16 AM





http://hyperphysics.phy-astr.gsu.edu/hbase/mechanics/motgraph.html

Dec 3-8:48 AM

Homework:
Page 104 #4, 5, 7, 8, 9
Handout "Review of Rates of Change"
Handout " Graphs and Rates of Change"
(#10 is a bonus...it's a bit tougher)

"Rock, you I can cover. Scissors, you're too big a risk."