You're not done yet!!!

Bolt 100m Edited.wmv

Physics:

micro-

The study of objects and their motion

" " matter and its energy

light/sound (photons) electricity (electrons)

Newtonian Mechanics

Macro-

larger objects, slower speeds

What questions can we ask about the motion of any moving object?

Where?

What?

When?

How?

What is the path the object took?

Where is the object?

When does it move?

How long does it move?

How far did it go?

~~How fast is the object?~~

Quantity	Unit	Symbol
position w/ direction	meters (m)	x
Change in position	meters (m)	Δx "Delta x"
displacement	meters (m)	d
distance		
time (when)	seconds (s)	t
duration (change in time)	sec (s)	Δt

position (M)

Duration(s)

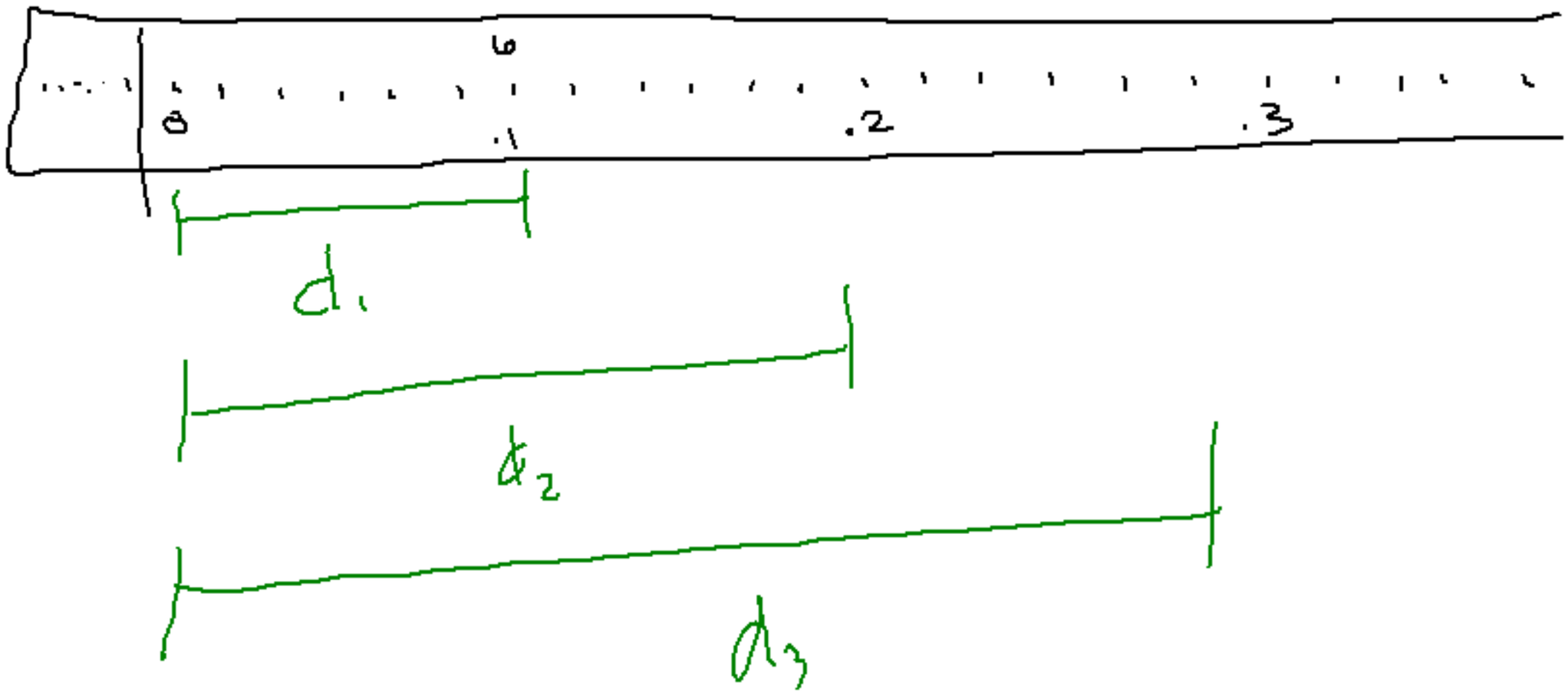
time (s) | distance (m)

.1

.2

.3

2.0s

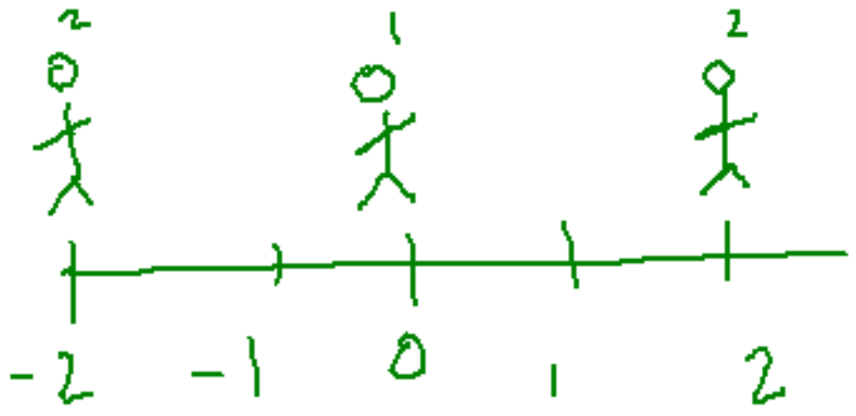

0
.1
.2
.3
d_1
d_2
d_3

$y = mx + b$

$$\text{Slope} = m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{\text{rise}}{\text{run}} = \frac{\text{distance}}{\text{time}} = \text{speed}$$

$$m = \frac{\text{displacement}}{\text{duration}} = \frac{\Delta x}{\Delta t} = \frac{x_2 - x_1}{t_2 - t_1} = v$$



$$\text{velocity} = \frac{\Delta x}{\Delta t}$$

rate of change of displacement

Speed

magnitude
(number)

velocity

magnitude + direction
(# + dir)

Scalar

Quantity w/ only mag.

Liters - Volume

time

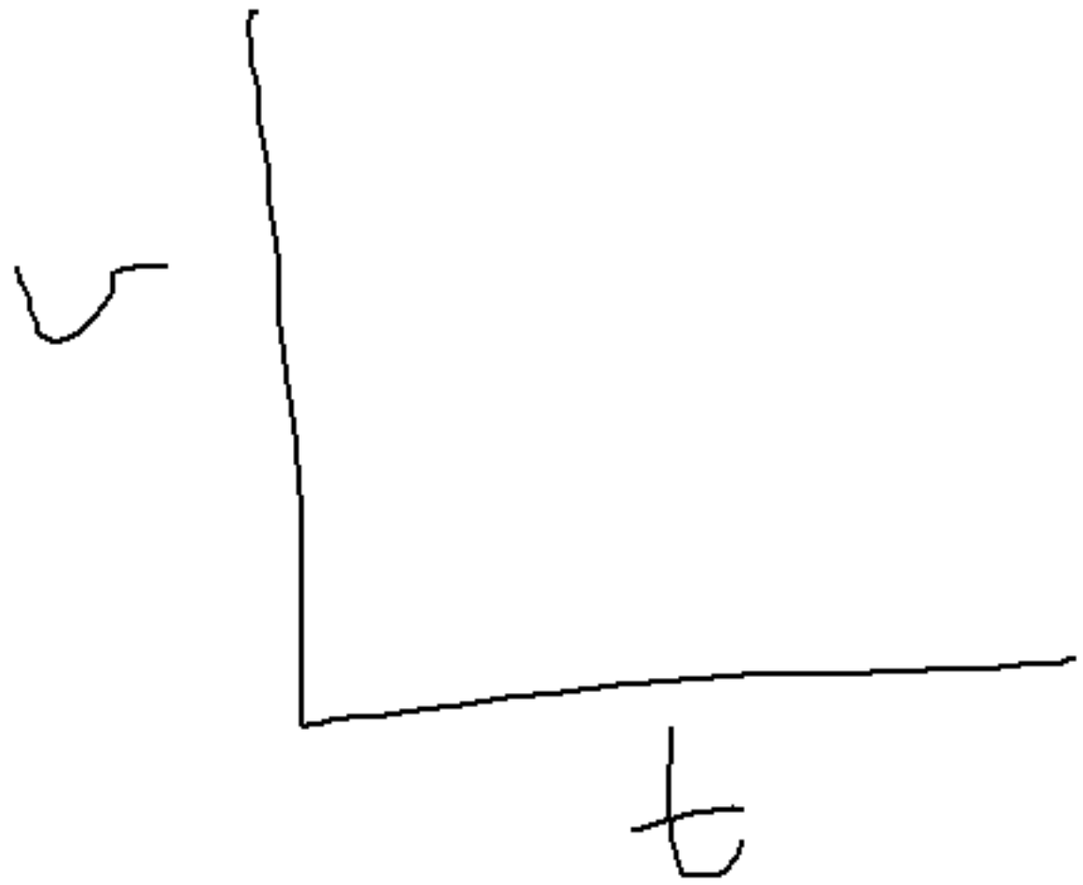
Vector

Quantity w/ mag + dir.

Forces

displacement

acceleration



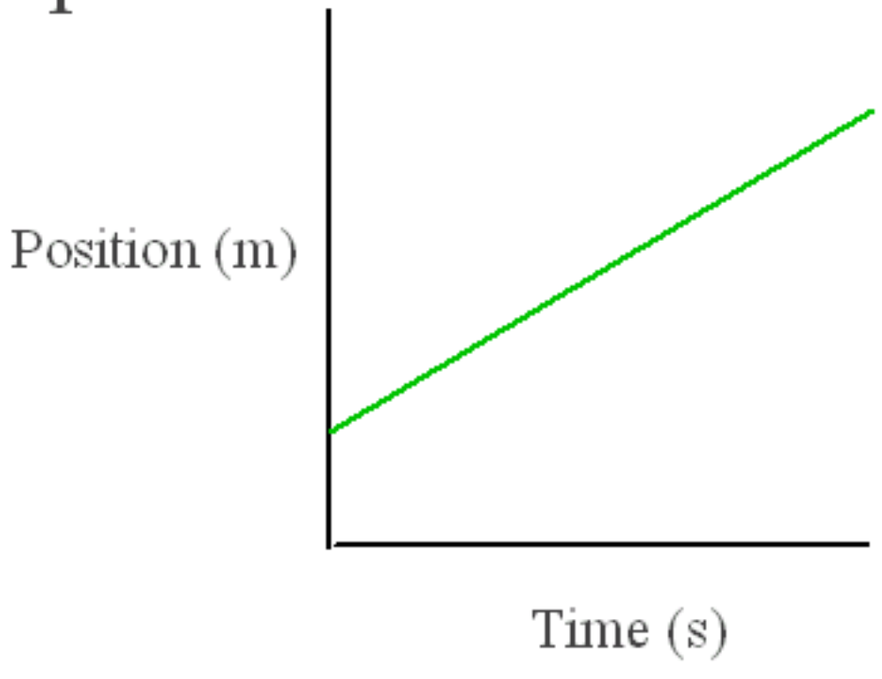
Friday 4-17-09

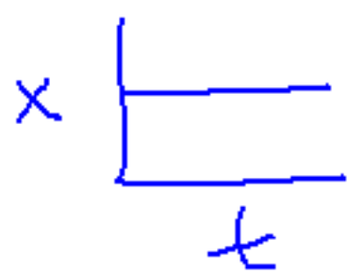
What is velocity? $v = \frac{\Delta x}{\Delta t}$ rate of change of Displacement

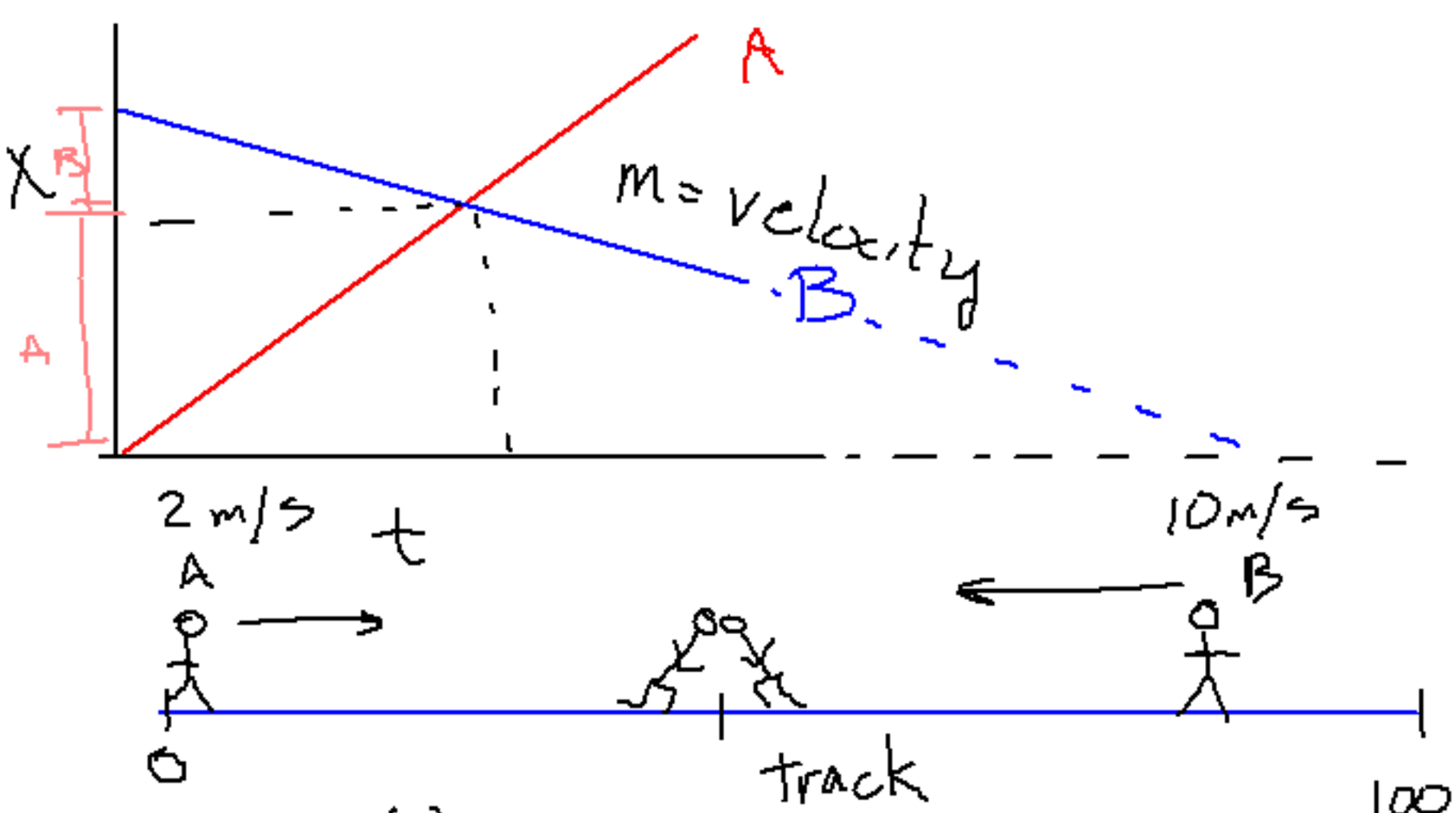
When graphing x-t, what does a straight line represent? constant

How was velocity/speed of the jeep determined in the lab yesterday? by finding the slope

What is the relationship between the two variables in this graph?







V = (+)

$$V = \frac{\Delta X}{\Delta t} = \frac{-}{+}$$

V = (-)

4-20-09

What is the definition of velocity and the equation that represents it?

$v = \frac{\Delta x}{\Delta t}$ rate of change of position

What is the difference between speed and velocity?

$s = \frac{d}{t}$ only (+) #'s scalar

velocity +, −, 0

What does a straight line on a graph mean?

Volume

time

mass

energy

Vectors

mag / direction

Forces

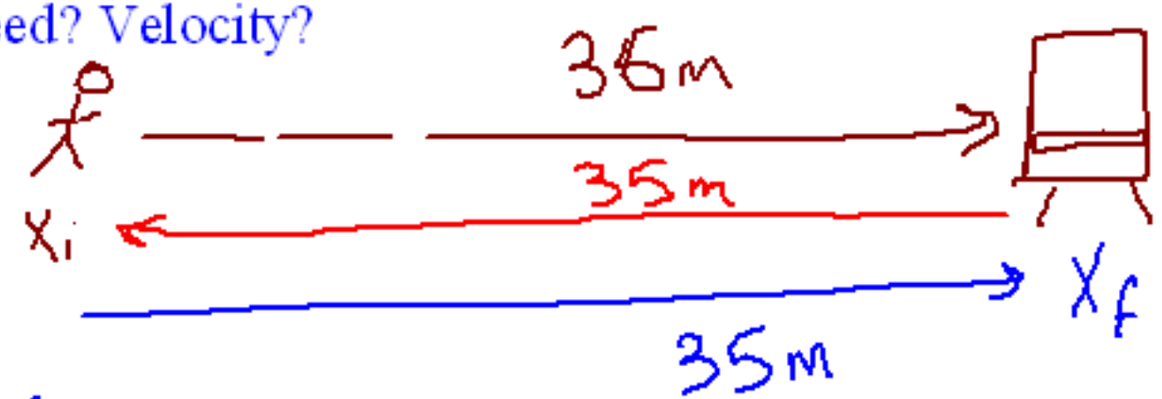
accel

Δx

4-21-09 Tuesday

Mr. Vilbas leaves the classroom and walks 35.0 m to the candy machine to get a Twix bar. When there, he realizes he left his wallet in the room. He walks to the room and then back to the machine. If this takes 2 minutes, what is his speed? Velocity?

$$s = \frac{d}{t}$$



$$v = \frac{\Delta x}{\Delta t}$$

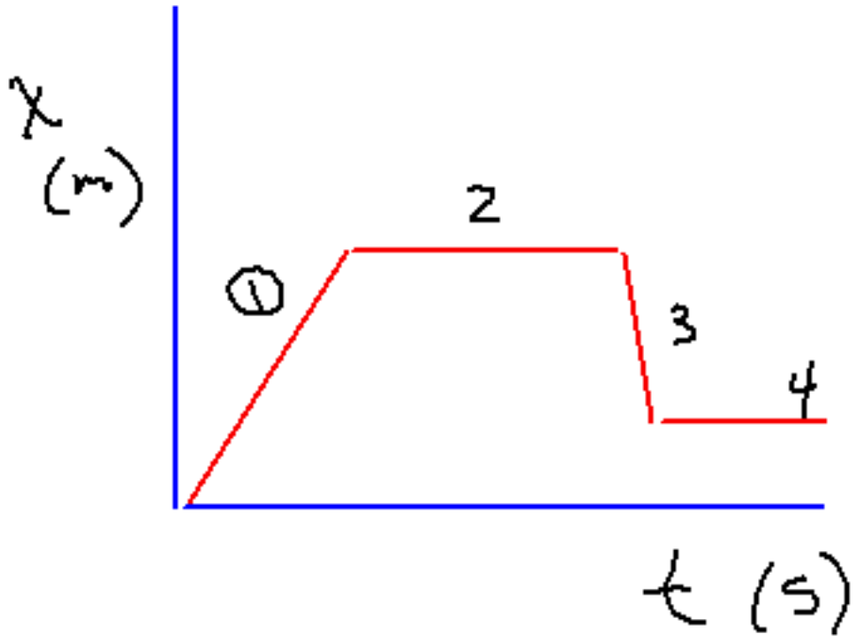
$d = 105m$

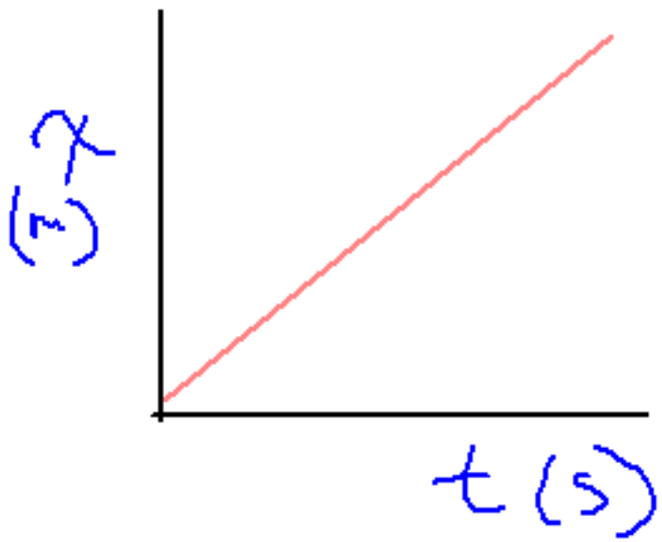
$\Delta x = 35m = 35 - 0$

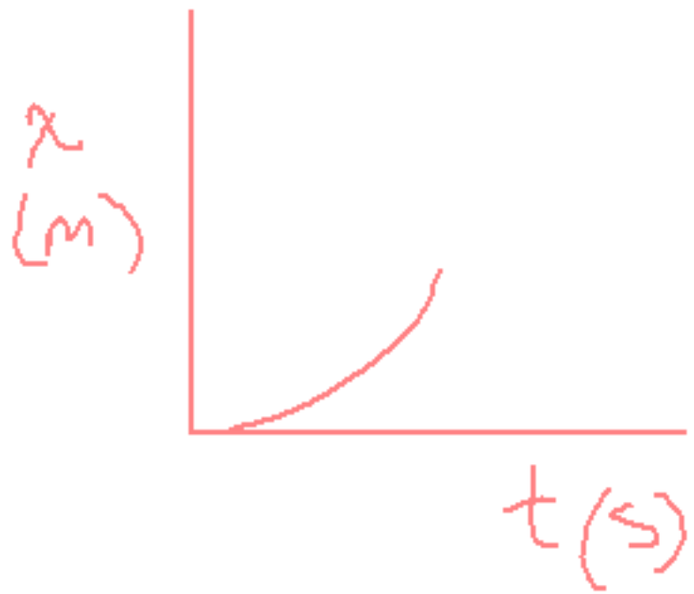
$t = \Delta t = 2min = 120s$

$s = \frac{105}{120} = .875$ m/s

$v = \frac{35}{120}$ .291 m/s


x
(m)
2
1
3
4
t (s)





Objective

To find the math. Rel. between x & t
for an accelerated object.

" " " math. Rel. between v & t for
" "

4-22-09 Earth Day!

What have you done to reduce your Carbon Footprint?

Essential Questions:

When an object accelerates, what happens to its position and velocity?

Lab objectives for an accelerating object:

What is the mathematical relationship between position and time?

What isthe mathematical relationship between velocity and time?

What evidence do we need to find a mathematical relationship?

Graph

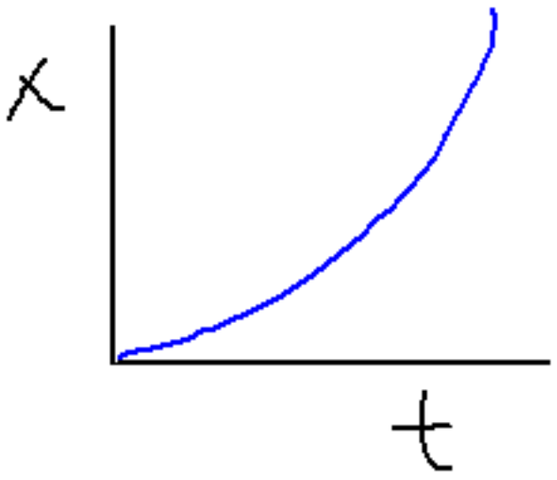
x - t

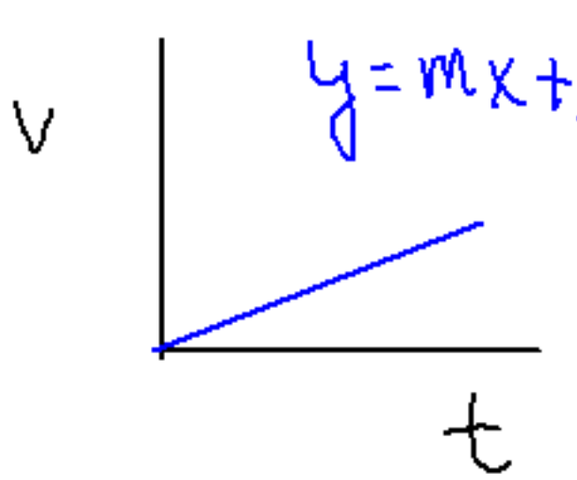
v - t

} line of best fit (only acceleration part)

Translated equation

Statement of the relationship





$y = mx + b$

Position is proportional to the square of time

$x \propto t^2$

t	x
1	1
2	4

velocity is directly prop. to time.

$v \propto t$

$$m = \frac{\Delta y}{\Delta x} \Rightarrow \frac{m/s}{s} \rightarrow m/s^2$$

$$a = \frac{\Delta V}{\Delta t}$$

acceleration is the rate of change of velocity

$$a = \frac{V_f - V_i}{\Delta t}$$

$$a\Delta t = V_f - V_i$$

$$V_f = V_i + a\Delta t$$ #1

solves for final velocity

A runner starts from rest and accelerates at a rate of 2.00 m/s/s. If the runner runs for 5.0 s, what is their velocity at the end of the race?

$V_i = 0\ m/s$

$V_f = ?$

$a = 2\ m/s^2$

$\Delta t = 5.0\ s$

$V_f = V_i + a\Delta t$

$V_f = 0 + (2\ m/s^2)(5\ s)$

$\frac{m}{s^2} \cdot s$

$V_f = 10\ m/s$

A Corvette is at rest on a race track. When the light turns green the car accelerates at a constant rate and reaches 26.8 m/s (60 mph) in 3.9 s. What is the car's rate of acceleration.

$V_i = 0$

$V_f = 26.8 m/s$

$a = ?$

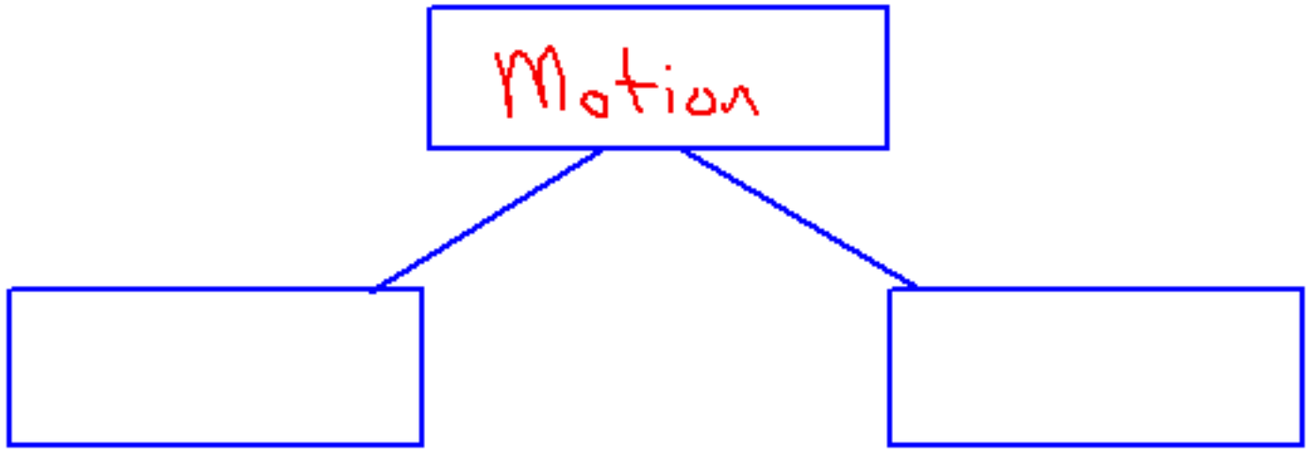
$\Delta t = 3.9 s$

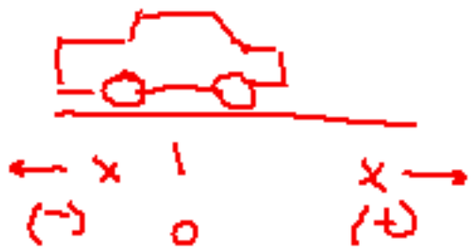
$V_f = V_i + a\Delta t$

$26.8 = 0 + a(3.9)$

$a = 6.87 m/s^2$

0
0 6.87 13.74 20.61 27.4
1 2 3 4


Motion



how does ___ change

V	a	Δx	velocity
V +	a +	increase +	increase
V +	a −	increasing +	decrease
V +	0	increase +, constant	constant
V −	a +	increasing (−)	decrease
V −	a −	increase (−)	increase (−)
V −	0	increase const.	const.

A yo-yo has a downward velocity of -2.0 m/s. After 3.0 seconds and an acceleration of +2.0 m/s/s, what is the final velocity?

$V_i = -2.0\ m/s$

$V_f = ?$

$a = +2.0\ m/s^2$

$\Delta t = 3s$

Δx

$V_f = V_i + at$

$V_f = -2 + 2(3)$

$V_f = 4\ m/s$

$\underline{V_f = 4\ m/s}$

accel.

proportional

$x \propto t^2$

#2

$$\Delta x = v_i t + \frac{1}{2} a t^2$$

solves for disp.

A boat is traveling at 5 m/s and the driver increases the throttle. If the boat accelerates at 2.5 m/s/s for 5.0 s, how far will it go?

$v_i = 5\ m/s$

$v_f = ?$

$a = 2.5\ m/s/s$

$\Delta t = 5\ s$

$\Delta x = ?$

$$\Delta x = v_i t + \frac{1}{2} a t^2$$

$$\Delta x = 5(5) + \frac{1}{2}(2.5)(5)^2$$

$$\Delta x = 56.25\ m$$

Accel WS II

① a. $v_i = 0$, $a = 5$, $t = 10.2$, $v_f = ?$

$v_f = 0 + (5)(10.2) = 51$ m/s

b. $\Delta x = 0(10.2) + \frac{1}{2}(5)(10.2)^2$

$= 260.1$ m

#3

$$\Delta x = \underbrace{\frac{1}{2}(v_i + v_f)}_{\text{average velocity}} \Delta t$$

$$d = r\,t$$

#4

$$v_f^2 - v_i^2 = 2a\Delta x$$

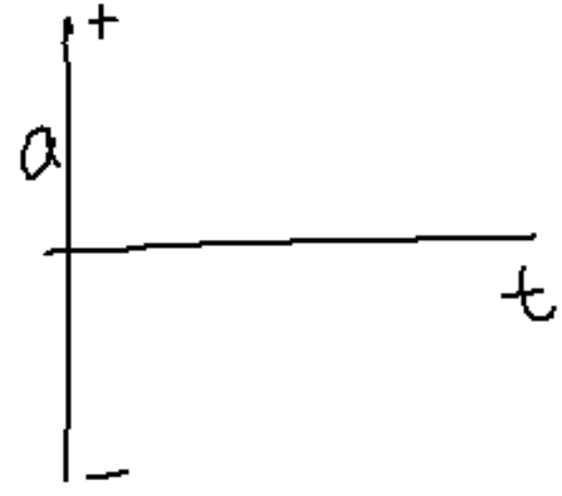
solves w/out time

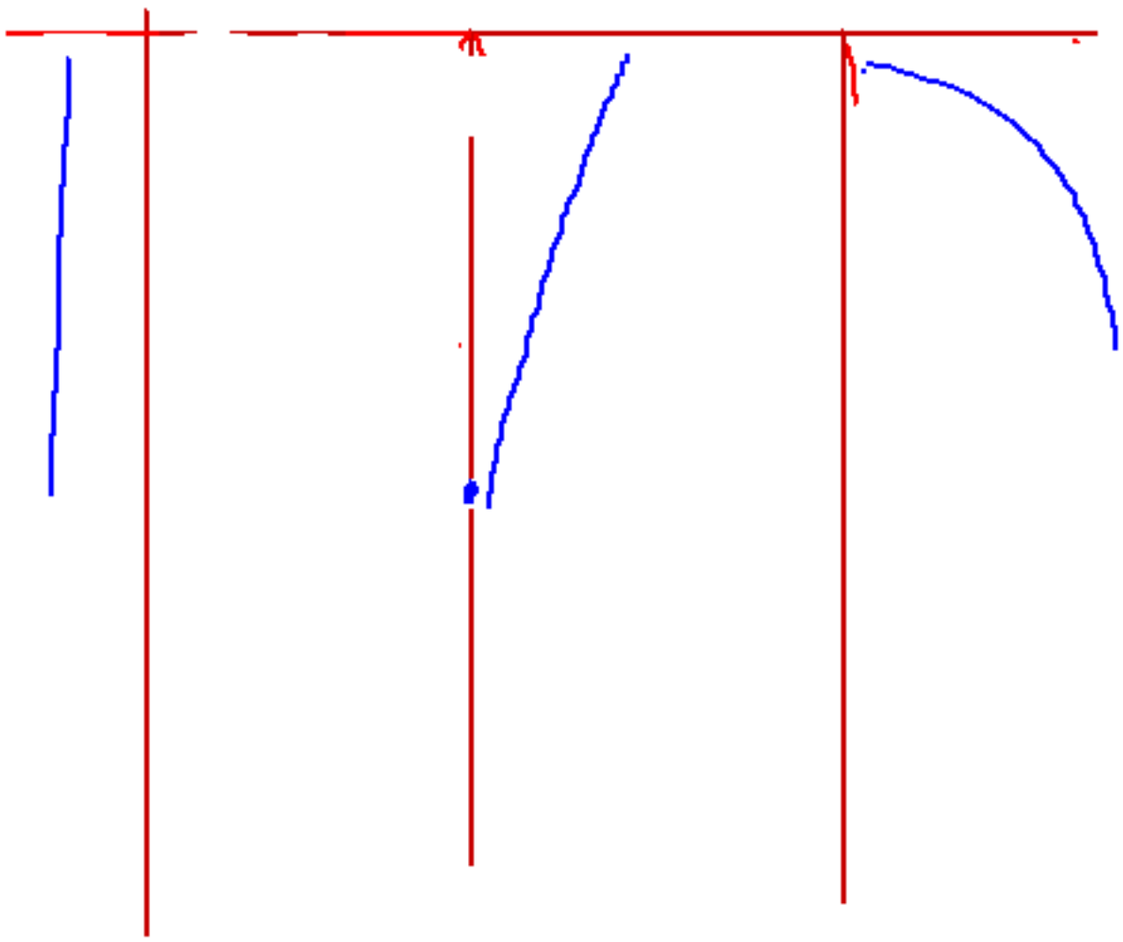
pg 103: 27-30


x
t

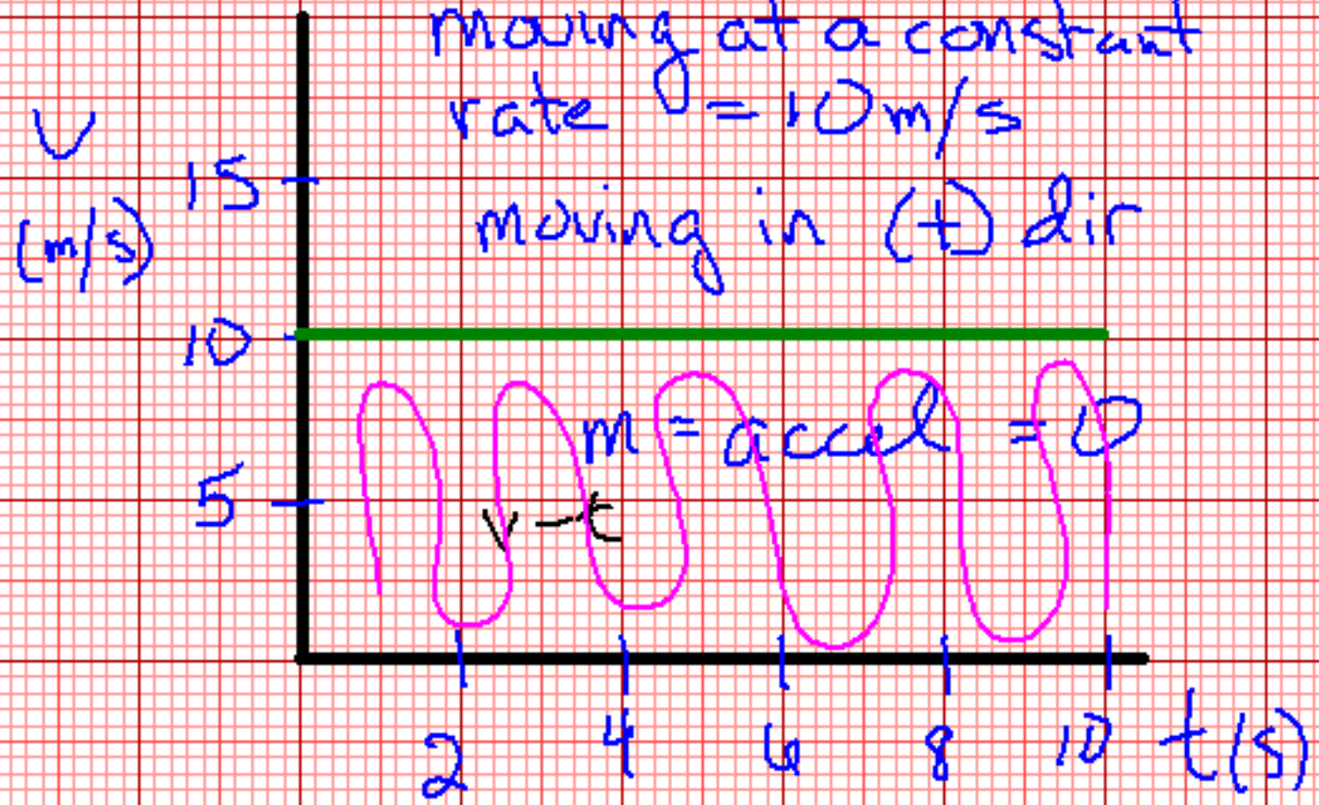

v
m = accel.
t

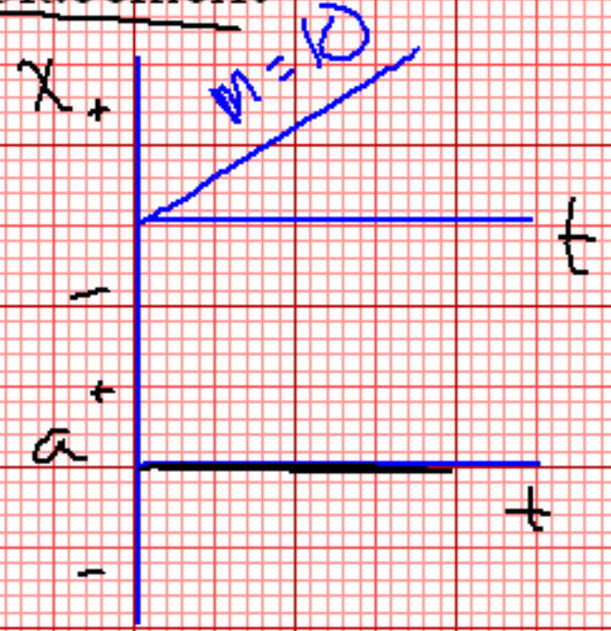

v
t


+
a
t
−



From this graph, draw the x-t and a-t graphs as well as calculate the displacement over the 10.0 second interval.





$\Delta x = ?$

$v_i = 10 m/s$

$v_f = 10 m/s$

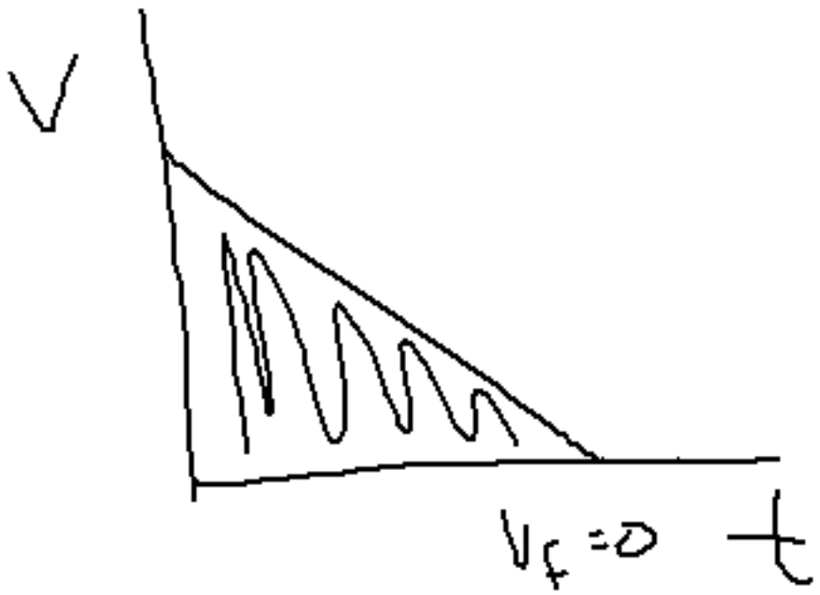
$a = 0$

$t = 10 s$

$$\Delta x = \frac{1}{2}(v_i + v_f)t$$

$$\frac{1}{2}(10+10)\,10$$

$$\Delta x = (10)10 = \underline{100 m}$$

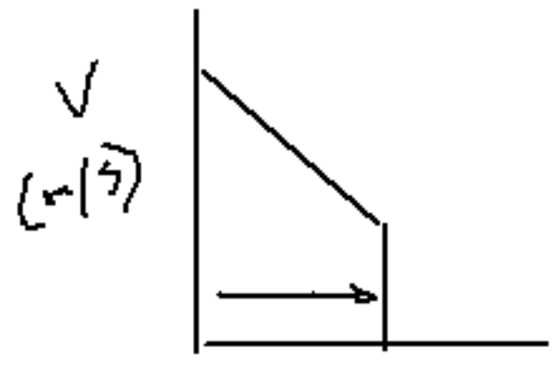


$$A = \frac{1}{2} b h$$

$$\updownarrow$$

$$\Delta x = \frac{1}{2} t (V_i)$$

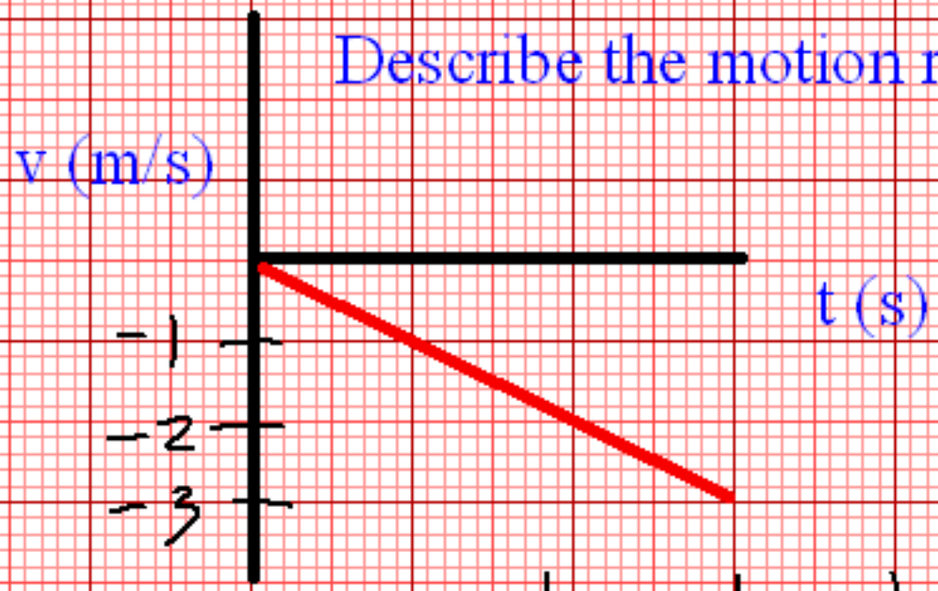
★ Area under a v-t = displacement



$$A = \frac{1}{2}(b_1 + b_2) h$$

$$\Delta x = \frac{1}{2}(V_1 + V_2) t$$

Describe the motion represented in this graph.



Characteristics

- slope

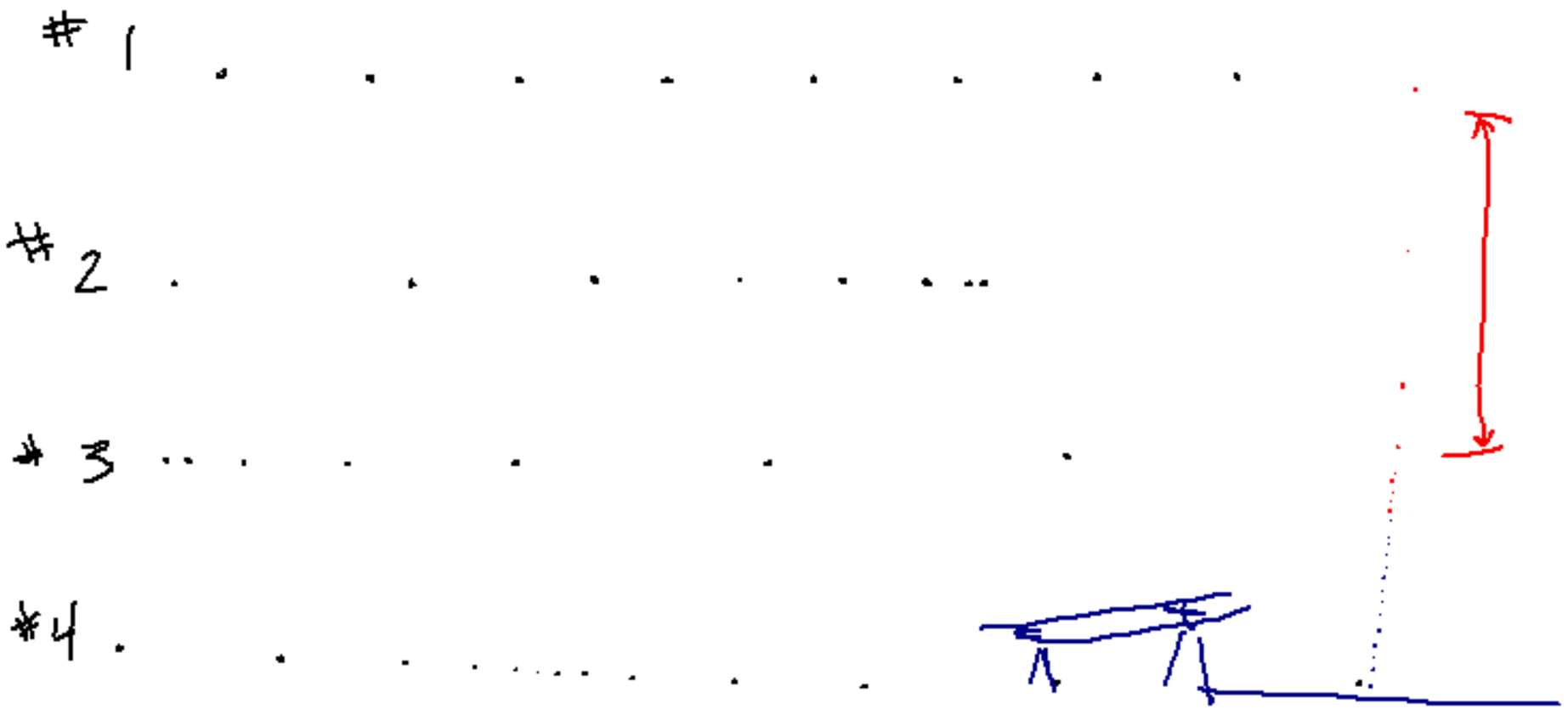
Motion

has (-) accel

(-) Δx

getting faster

A car is driving with a leaky oil pan. A drop of oil leaks out every second. Describe the motion of the car according to these drawings:



V_i = 22.5 m/s

V_f = 0

$a = -9.81 m/s^2$

$V_f = V_i + at$

$0 = 22.5 + (-9.81)t$

$-22.5 = -9.81t$

$t = 2.29 s$

(A) $2.29 \times 2 = 4.58 s$

$V_f^2 - V_i^2 = 2a\Delta y$

$0 - (22.5)^2 = 2(-9.81)\Delta y$

$-506.25 = -19.62\Delta y$

$25.80 m = \Delta y$

(c) What is the velocity when the ball is caught?

$v_i = 0$

$v_f =$

$a_g = -9.81 \text{ m/s}^2$

$t = 2.29 \text{ s}$

$\Delta y = 25.80 \text{ m}$

$v_f = v_i + at$

$v_f = 0 + -9.81(2.29)$

$v_f = -22.46 \text{ m/s}$

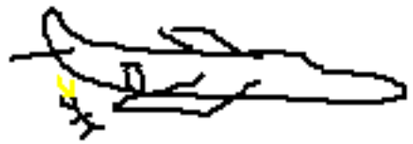
$\simeq -22.5$

Free fall

when an object is only acted on by gravity (no other forces)
ex air resistance

$a_g = -9.81 \, m/s^2$

- velocity increases
Δy increase $\propto t^2$
↑ proportional



$\Delta y = -10000\ m$

$a = -9.81\ m/s^2$

$V_i = 0$

$t = ?$

$$-10000 = 0t + \frac{1}{2}(9.81)t^2$$

$$-10000 = -4.905t^2$$

$$2038.74 = t^2$$

$$t = 45.155$$

Review activity

Your objective is to make test questions:

Each group must make the following type of questions:

- True/False
- Multiple Choice
- Short answer/equation
- Graphing (draw graph or explain graph)

The number of students you have in group = number of questions

Must have complete answers with all work

collecting: Questions & at 11:55

Answers !

In a Round Robin style, move from desk to desk and answer the questions on a seperate sheet of paper.
On single sheet, grade each group according to the following rubric.
Grading:

Questions to ask on a scale of 1-5 (1 = never/bad, 5= always/perfect

1. How relevent is this question to the unit?
2. How difficult is the question?
3. How worthy is this question to be on test?