Exploration 1.1

My table

Time (s)	Position (m)
0	0
4	8
6	12
8	16.1
10	20
12	23.9

Q, Do your answers agree with the table?

e) ⇒ Yes, they agree with the data in the table because the value I found lie within ± 0.1 uncertainity of the data tabulated by the algorithm. The error I got is because its not easy to precisely locate the person's position each time.

Exploration 1.2

a) Limits of y_0

Minimum $y_0 = 8$ maximum $y_0 = 12.5$

b) 1) The function's limit's might have been chosen arbitrarily

2) Going beyond the limits may not follow the model programmed.

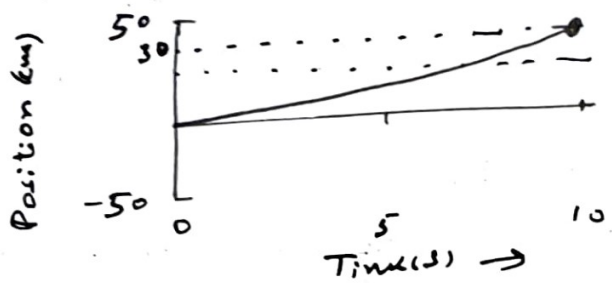
c) When we type "abcd" It reports that the value must be between 8 and 12.5 and that the entered value is "abcd".

Exploration 1.3

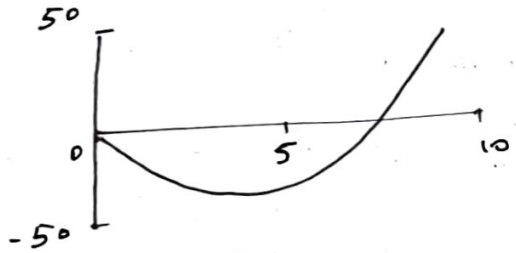
a) 0.3 * t * t

i) It stays in partially (doesn't go out completely even at the end of animation)

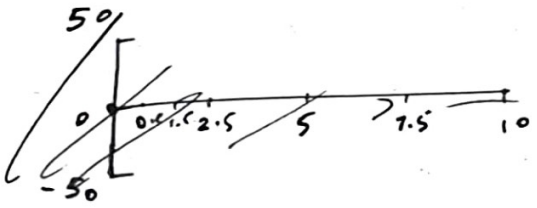
ii)

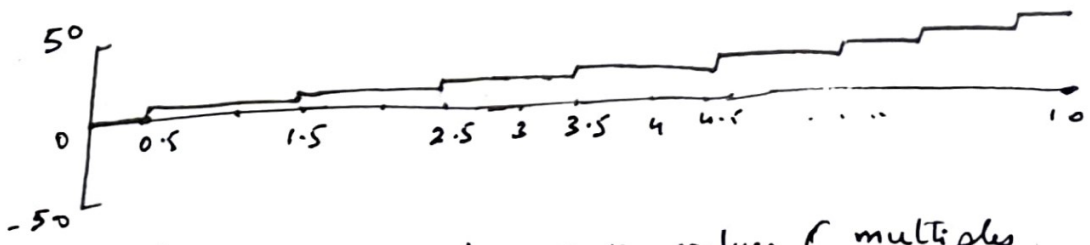


b) -20 * t + 3 t ^ 2



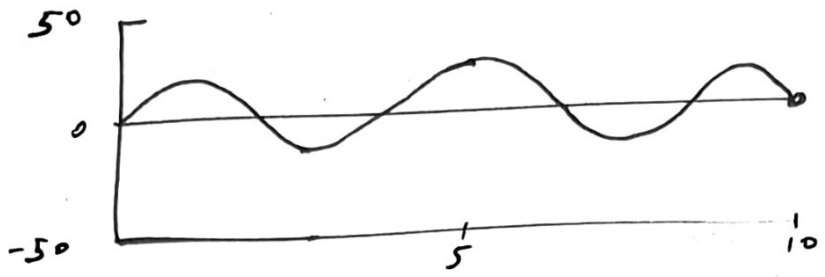
c) int(t)



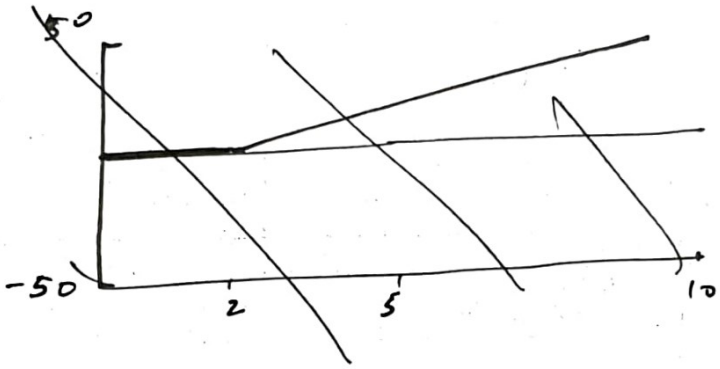


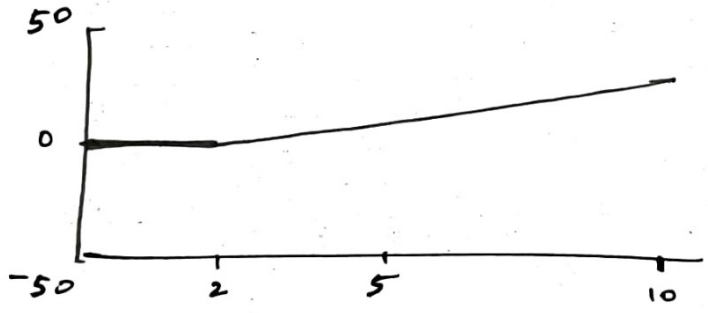
It's jumping at 0.5 values (multiples of 0.5)

d) $10 * \sin(pi * t/2)$



e) $step(t-2) * 3 * (t-2)$

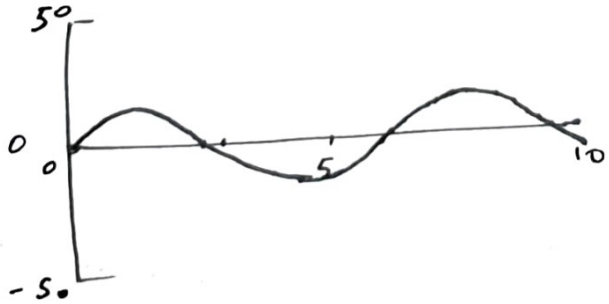




Try some other functions (keep the lamborghini in screen)

i) Function that keeps lamborghini in screen: $10 * \sin(t)$

ii)



Problem 1.1

Animation 1 (ball)

Main scale reading (MSR) = 0.3 cm

Vernier scal reading (VSR) = 2×0.01 cm = 0.02 cm

$\therefore$ Total reading = MSR + VSR

= 0.32 cm

Animation 2 (Rectangle)

(MSR) = 2.4 cm

(VSR) = 6×0.01 cm = 0.06 cm

Total reading = 2.4 + 0.06 = 2.46 cm

Animation 3 () shape thing

(MSR) = 0.6 cm

(VSR) = 8×0.01 cm = 0.08 cm

Total reading = 0.6 + 0.08 = 0.68 cm

Animation 4: car

MSR) = 1.3 cm

VSR = 9×0.01 cm = 0.09 cm

Total reading = 1.3 + 0.09 = 1.39 cm

Problem 1.2

Data added

t	x
0	0
1	1
2	2
3	3
4	4
5	5

a) slope = +1.00

; intercept = +0.00

b) Slope of 'x' v/s 't' tells us the speed of the lamborghini.

Intercept tells us the position of the car at t = 0 (For the linear regression made from our data points)

Problem 1.3

a) Position v/s time was easiest to match

acceleration v/s time was hardest to match

b) In the picture we are moving the truck's position to match

1) position v/s time
2) velocity v/s time
3) acceleration v/s time

To match 1)

we just have to move the truck by Δx units for every increase in Δt. after $t = 5$ seconds which is easy.

To match 2)

which is '0' speed until $t = 5$ sec then a increasing speed.
But we are trying to match it using position of the truck. So, we have to increase rate of change of position (i.e velocity) with time which difficult.

To match 3

Here we are trying to match $\frac{d^2y}{dt^2} = \frac{d}{dt}\left(\frac{dy}{dt}\right)$
i.e acceleration, here we have to move the truck's position in such a way that the rate of change of velocity increases at a constant rate which is very difficult.

Table

Animation 1	Initial position	Initial velocity	Acceleration
Red (R)	−47.19 cm	0 cm/s	1.0 cm/s^2
Green (G)	+0.44 cm	0 cm/s	1.01 cm/s^2
Blue (B)	+55.68 cm	0 cm/s	1.01 cm/s^2 → cm/s^2!!

Animation 2	Initial position	Initial velocity	Acceleration
(R)	0.44 cm	0.15 cm/s	0.997 cm/s^2
(G)	0.44 cm	2.46 cm/s	0.997 cm/s^2
(B)	0.44 cm	4.92 cm/s	0.997 cm/s^2

Animation 3	Initial position	Initial velocity	acceleration
R	1.58 cm	0.8 cm/s	1.02 cm/s^2
G	1.58 cm	0.8 cm/s	2.01 cm/s^2
B	1.58 cm	0.8 cm/s	2.96 cm/s^2

Animation 3

From the position (x) v/s (t)(time) we can see that all of them are starting from the same position. & Have different velocity as $\frac{dx}{dt}$ is different for all.

Truck Blue > Truck green > Truck Red (Velocity)

As velocity is increasing at a greater rate for Truck blue > Truck green > Truck Red {

⇒ acceleration of Truck Blue > Truck green > Truck Red.

a) The initial position will only decide from where they start. Therefore, the graph will start at different points based on that. However, the rest of the motion will depend on the velocity and acceleration of the trucks.

c) When analysis was done taking both x v/s t and v v/s t into consideration. It was confirmed that what we deduced from x v/s t of Animation 1, 2, 3 was correct