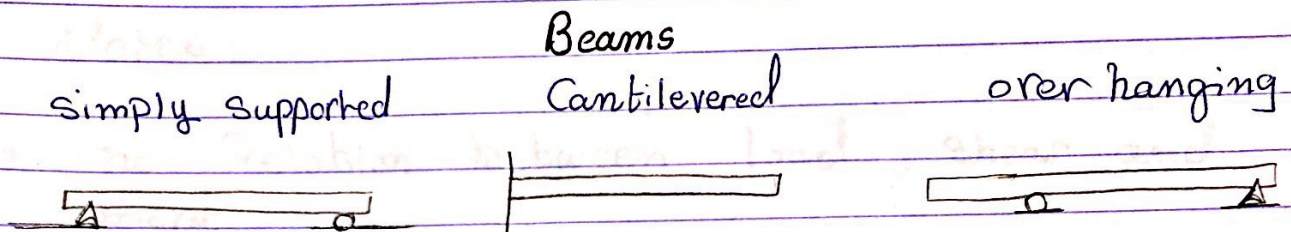


Chapter 6: Bending

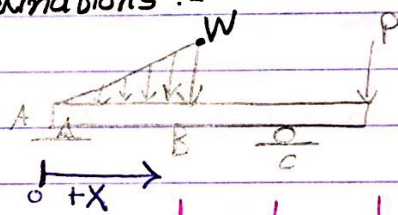
6.1 + 6.2 is all about Drawing Shear Diagrams.



Shear Diagram :-

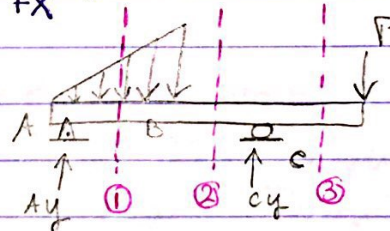
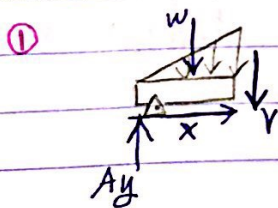
Steps :-

1- Specify your coordinations :-
a starting point and positive Dir.



2- Divide your Beam into Regions and sign

Directions of V :-



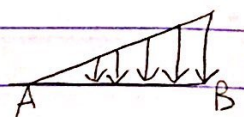
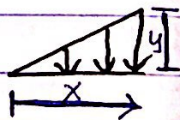
$$A_y - V - W = 0$$

$$V = A_y - W$$

$$V = A_y - \left(\frac{1}{2}\right)(x)(y)$$

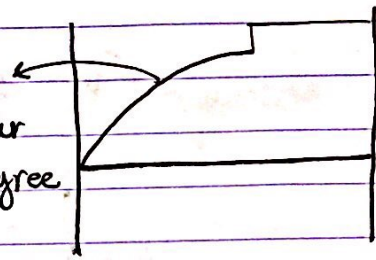
Relating w to x :
using Triangles

$$\frac{y}{x} = \frac{W}{AB}$$



3- Write V in terms of x and Draw Shear Diagram.

Since
load is linear
V is 2nd Degree.



Notes:

* The Relation between load, Shear and Moment

$W = \frac{dV}{dx} \Rightarrow$ Shear $\frac{dV}{dx}$ نسبة في الـ Diagram
نسبة الـ load الى الـ Diagram
العلاقة

$V = \frac{dM}{dx} \Rightarrow$ Moment $\frac{dM}{dx}$ نسبة في الـ Diagram
نسبة الـ V الى الـ Diagram
العلاقة

► How to know if the Function is concared up or clown?

Using Note * : take the value of slope at any point in M and if it's equal to V at that point then Your Drawing is right I will explain this more in an example.

Shear and Moment Diagram:

Example: G-22

1) Find Reactions

$$\sum M_A = 0$$

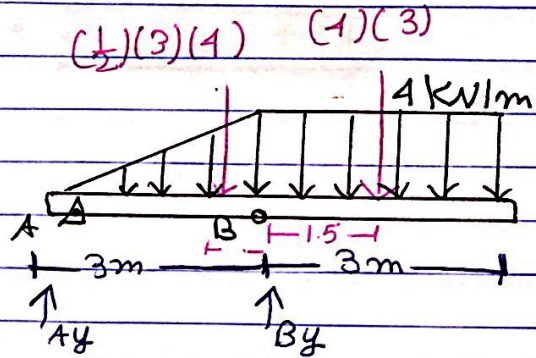
$$(B_y)(3) - \left(\frac{1}{2}\right)(3)(4)(2) - (4)(3)(4.5) = 0$$

$$B_y = 22$$

$$\sum F_y = 0$$

$$22 + A_y - 6 - 12 = 0$$

$$A_y = -4 = 4 \downarrow$$



2) Take two sections:

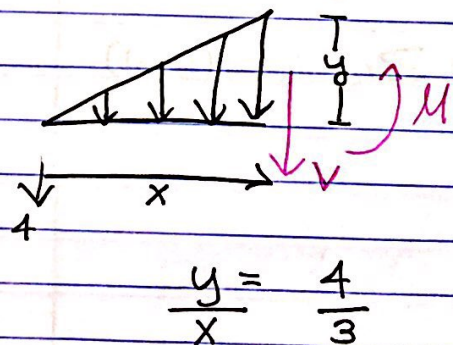
First: $0 \leq x < 3$

V:-

$$-4 - V - \left(\frac{1}{2}\right)(x)(y) = 0$$

$$V = -4 - \left(\frac{1}{2}\right)(x)\left(\frac{2x}{3}\right)$$

$$V = -4 - \frac{2x^2}{3}$$



M:-

$$\sum M = 0 \Rightarrow M + (4)(x) + \left(\frac{1}{2}\right)(x)\left(\frac{2x}{3}\right)\left(\frac{1}{3}x\right) = 0$$

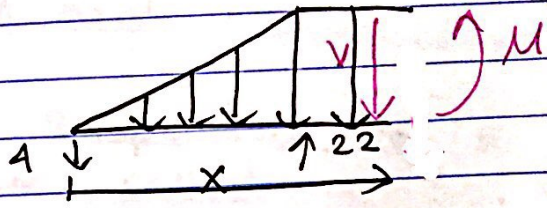
$$M = -4x - \frac{2x^3}{9}$$

For $3 \leq x < 6$

$V:-$

$$-4 + 22 - V - \left(\frac{1}{2}\right)(3)(4)$$

$$- (X-3)(4) = 0$$



$$V = 18 - 6 - 4(X-3)$$

$$V = 12 - 4(X-3)$$

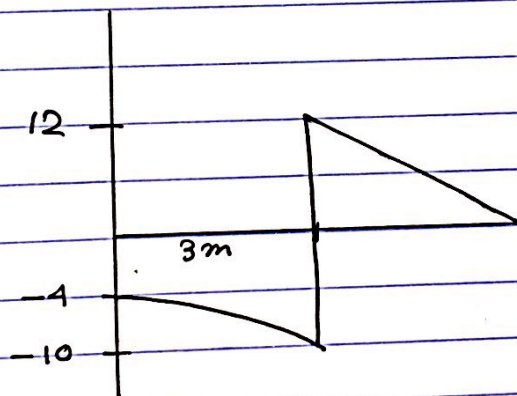
$M:-$

$$\sum M = 0 \Rightarrow M + (4)(x) - (22)(x-3) + \left(\frac{1}{2}\right)(3)(4)(x-2) + (X-3)(4) \left(\frac{X-3}{2}\right)$$

$$M = -4x + 22(x-3) + 6(x-2) - 2(x-3)^2$$

Now Draw :-

$V:-$



كيف نعرف اذا
ال curve مقعر لأعلى
أو لأسفل ؟

اذا كان ال W (load)

$M:-$

