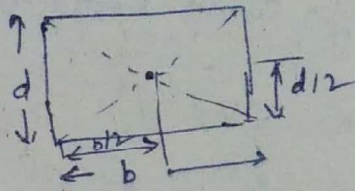
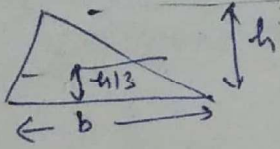


For i) Rectangle section.



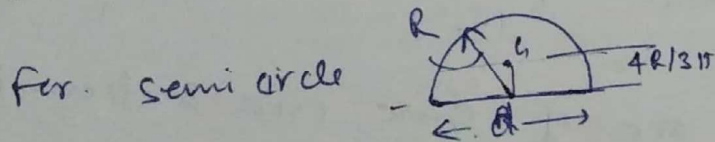
C.G. lies at the intersection of diagonals.

ii)



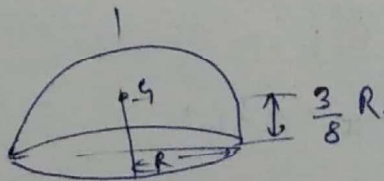
C.G. lies at point of intersection of three medians

iii) For circular section - C.G. lies at the centre of circle.



iv) For sphere of radius R - C.G. lies at a distance of R from every point

For hemi sphere



v) C.G. of uniform rod is at its mid point.

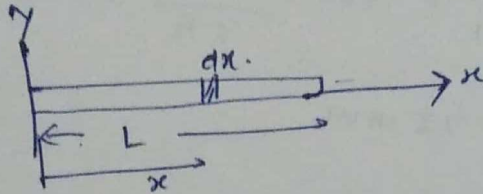
Find the centroid of a uniform wire of length L .

(5)

Solⁿ.

$$\bar{x} = \frac{\sum x \, d\ell}{\sum d\ell}$$

$$\bar{y} = \frac{\sum y \, d\ell}{\sum d\ell}$$



$$\bar{y} = 0,$$

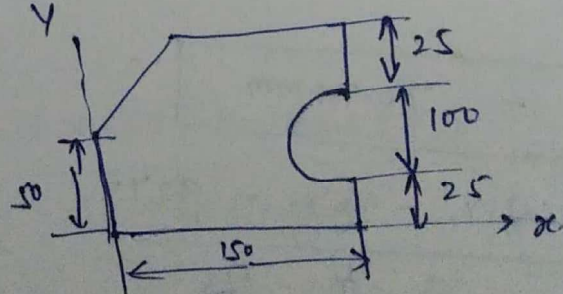
$$\sum x \, d\ell = \int_0^L x \cdot dx$$

$$= \left[\frac{x^2}{2} \right]_0^L = \frac{L^2}{2}$$

$$\sum d\ell = \int_0^L dx = L$$

$$\bar{x} = \frac{L^2/2}{L} = L/2$$

Q. Locate the centroid of area shown in fig. all dimensions are in mm.



Solⁿ
 The given area can be considered as a rectangle of size 150×150 mm minus a semi circle of radius 25 mm minus a triangle of base 50 mm & height 100 mm.

$$a_1 = 150 \times 150 = 22500 \text{ mm}^2$$

$$x_1 = 75 \text{ mm}, \quad y_1 = 75 \text{ mm}$$

$$\text{Semi } \odot \quad a_2 = \frac{\pi r^2}{2} = \frac{\pi \times 50^2}{2} = 3925 \text{ mm}^2$$

$$x_2 = 150 - \frac{4r}{3\pi} = 150 - \frac{4 \times 50}{3\pi} = 128.77 \text{ mm}$$

$$y_2 = 25 + 50 = 75 \text{ mm}$$

$$\text{Triangle!} \quad a_3 = \frac{1}{2}bh = \frac{1}{2} \times 50 \times 100 = 2500 \text{ mm}^2$$

$$x_3 = \frac{b}{3} = \frac{50}{3} = 16.67 \text{ mm}$$

$$y_3 = 150 - \frac{h}{3} = 150 - \frac{100}{3} = 116.67 \text{ mm}$$

$$\bar{x} = \frac{a_1 x_1 - a_2 x_2 - a_3 x_3}{a_1 - a_2 - a_3}$$

$$= \frac{22500 \times 75 - 3925 \times 128.77 - 2500 \times 16.67}{22500 - 3925 - 2500}$$

$$= 70.94 \text{ mm}$$

$$\bar{y} = \frac{a_1 y_1 - a_2 y_2 - a_3 y_3}{a_1 - a_2 - a_3}$$

$$= \frac{22500 \times 75 - 3925 \times 75 - 2500 \times 116.67}{22500 - 3925 - 2500}$$

$$= 68.52 \text{ mm}$$

$$= 68.52 \text{ mm}$$