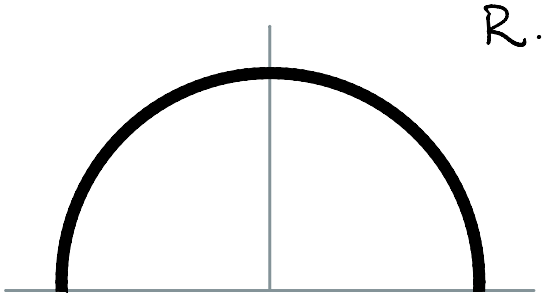
CENTRE OF MASS OF SEMICIRCULAR RING:



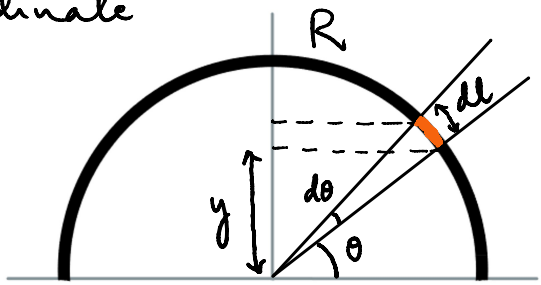
Consider a semi-circular ring of mass M and radius R as shown.

(i) How is the mass of the system distributed?
   (a) Over a length
   (b) Over an area
   (c) Over a volume.

(ii) Is it a continuous mass distribution or a collection of few separate particles?

(iii) Formula for COM of continuous mass distribution?

(iv) Consider a certain y-coordinate and the mass present at that y-coordinate as shown:



Assume the element subtends an angle dθ at the centre.

Express length 'dl' of the element in terms of R and dθ.

R and dθ.

(v) Total mass is M and radius is R, then what is the mass per unit length λ?

(vi) In q. no. iv and v, you have derived length 'dl' and mass per unit length λ. Now express mass 'dm' of the element in terms of M and dθ. (using dl and λ).

(vii) Express the y-coordinate of the element in terms of R and θ.

(viii) Now that you derived y in terms of θ and also dm in terms of dθ,

Integrate $\dfrac{\int y\,dm}{\int dm}$

(ix) To cover the entire semicircle, what are the initial and final values of θ? Use them as limits of integration.

Use them as limits of integration.

⊗ Substitute limits and get y-coord. of com.
Check with the answer given in notes if it matches with the answer derived here.