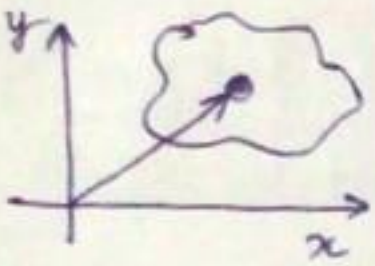
Continuous Mass System



$$x_{cm} = \frac{\int x\,dm}{\int dm}$$

$$y_{cm} = \frac{\int y\,dm}{\int dm}$$

$$z_{cm} = \frac{\int z\,dm}{\int dm}$$

Volume of Sphere $= \frac{4}{3}\pi R^3$

Area of disc full $= \pi r^2$

Volume of cone $= \frac{1}{3}\pi R^2 h$

Centre of mass of some uniform symmetric bodies :

1) Ring (Half)



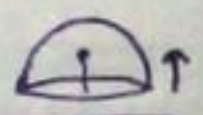
$COM = \frac{2R}{\pi}$

2) Disc (Half)



$COM = \frac{4R}{3\pi}$

3) hemisphere shell



$COM = \frac{R}{2}$

4) Solid hemisphere



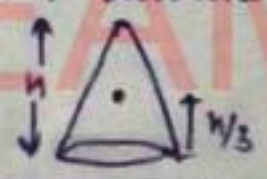
$COM = \frac{3R}{8}$

5) Solid cone



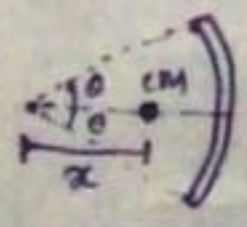
$COM = \frac{h}{4}$

6) Hollow cone



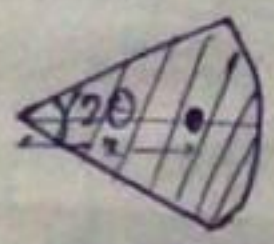
$COM = \frac{h}{3}$

7) Circular arc



$x = \frac{r\sin\theta}{\theta}$

8) Sector of circular plate



$x = \frac{2R\sin\theta}{3\theta}$

θ = radian

Moving COM

$$\vec{V}_{cm} = \frac{m_1\vec{v}_1 + m_2\vec{v}_2 + \ldots}{m_1 + m_2 + \ldots}$$

$\vec{P}_{sys} = m\vec{V}_{cm}$

$$\vec{a}_{cm} = \frac{m_1\vec{a}_1 + m_2\vec{a}_2 + \ldots}{m_1 + m_2 + \ldots}$$

Man Plank system

Displacement of plank $x = \frac{mL}{m+M}$

* A body can have momentum without mechanical energy
* A body can have energy without momentum.

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