

3B Centre of Mass of a Uniform Body

For a uniform solid body, the centre of mass lies:

Uniform solid sphere:

Uniform solid right circular cylinder:

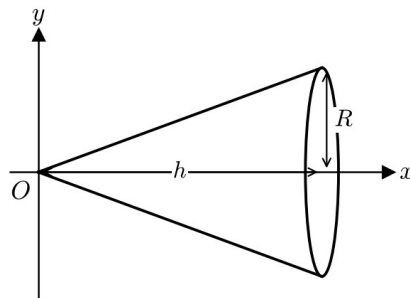
Solid of revolution about the x-axis: divide into thin discs of radius y and thickness δx . Mass of one disc:

$$\bar{x} =$$

Solid of revolution about the y-axis:

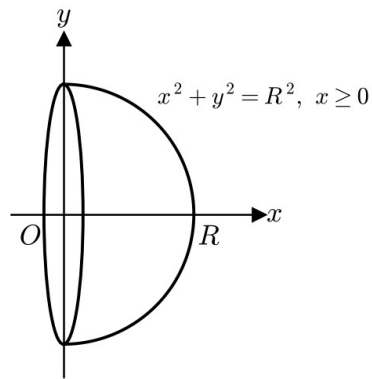
$$\bar{y} =$$

1. Find the centre of mass of the uniform solid right circular cone with radius R and height h .



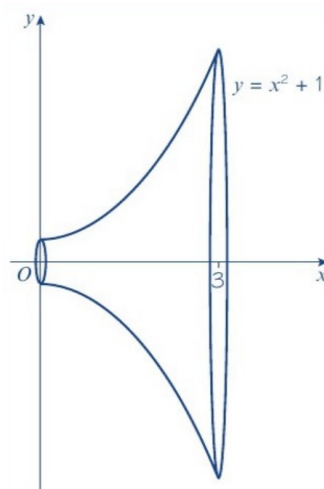
Centre of mass of a uniform solid cone:

2. Find the centre of mass of the uniform solid hemisphere with radius R .

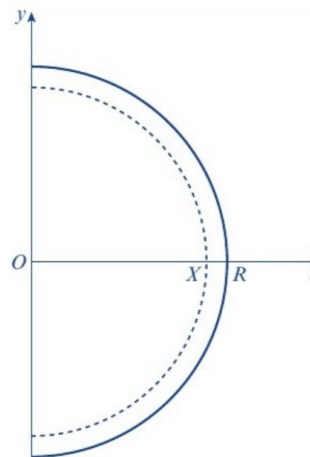


Centre of mass of a uniform solid hemisphere:

3. Find the centre of mass of the uniform solid of revolution formed by rotating the finite region enclosed by the curve $y = x^2 + 1$, the x -axis and the lines $x = 0$ and $x = 3$ through 360° about the x -axis as shown in the diagram below.



4. Find the centre of mass of the uniform hemispherical shell with radius R .

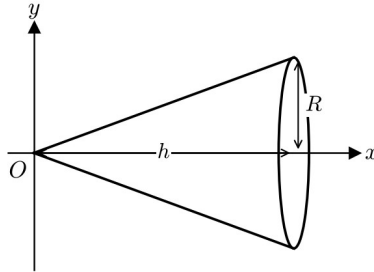


Hint: remove a solid hemisphere of radius X from a solid hemisphere of radius R , then let $X \rightarrow R$.

	Mass	Centre of mass
Solid hemisphere, radius R		
Solid hemisphere, radius X		
Hollow shell		

Centre of mass of a uniform hemispherical shell:

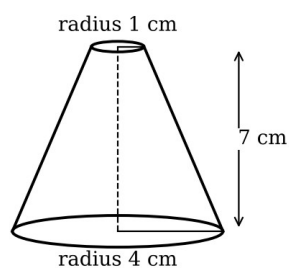
5. Show that the centre of mass of the uniform hollow right circular cone with radius R and height h is at a distance $\frac{3}{8}h$ from the base along the axis of symmetry.



Centre of mass of a conical shell:

Frustum:

6. Find the position of the centre of mass of the frustum of a right circular uniform cone, of end radii 1 cm and 4 cm, and of height 7 cm.



	Mass	Distance of centre of mass from base
Large cone		
Small cone		
Frustum		

