Announcements

- Written exam tomorrow (Thursday, Nov 8) – do you know your room assignment?

- Upcoming deadlines:
- Study for written exam

Center of Gravity

$$\bar{x} = \frac{\int \tilde{x}\, dW}{\int dW}$$

$$\bar{y} = \frac{\int \tilde{y}\, dW}{\int dW}$$

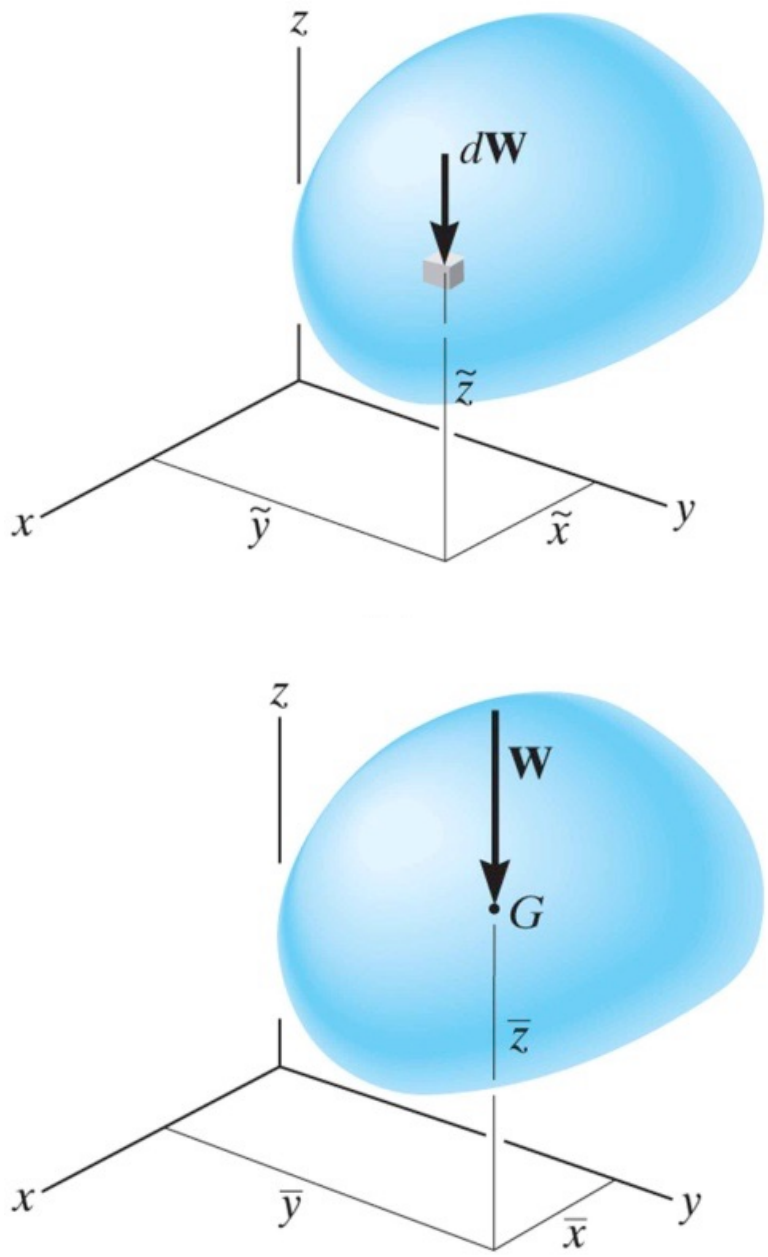
$$\bar{z} = \frac{\int \tilde{z}\, dW}{\int dW}$$

Center of Volume

$$\bar{x} = \frac{\int \tilde{x}\, dV}{\int dV}$$

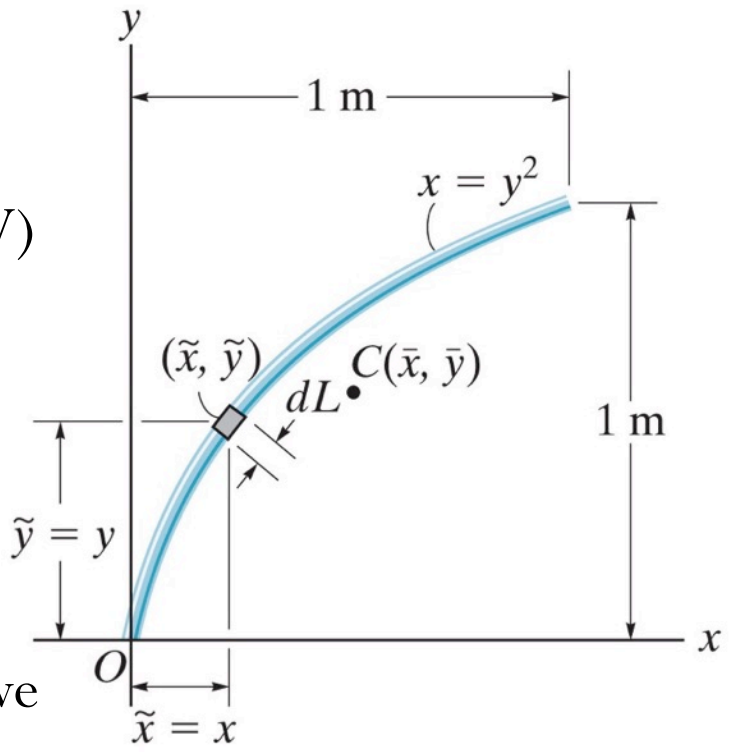
$$\bar{y} = \frac{\int \tilde{y}\, dV}{\int dV}$$

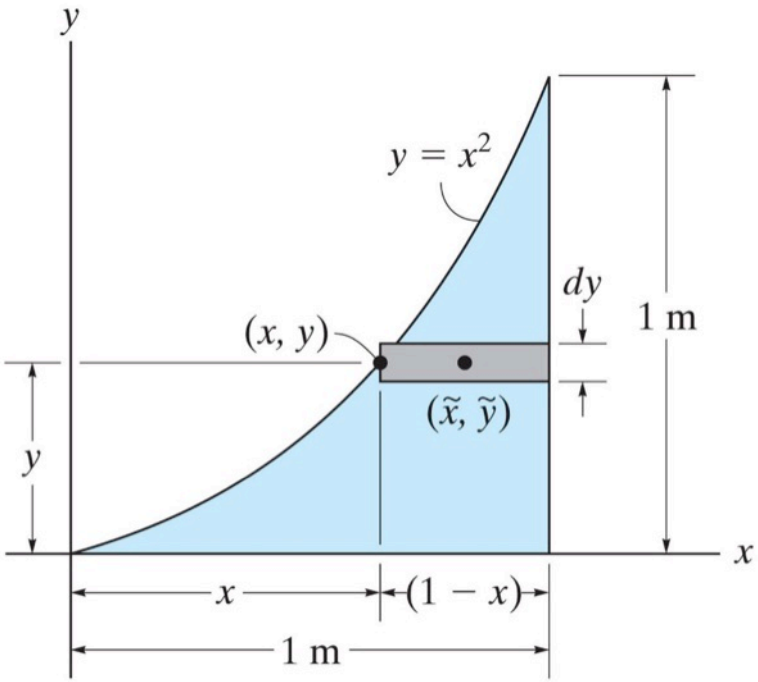
$$\bar{z} = \frac{\int \tilde{z}\, dV}{\int dV}$$



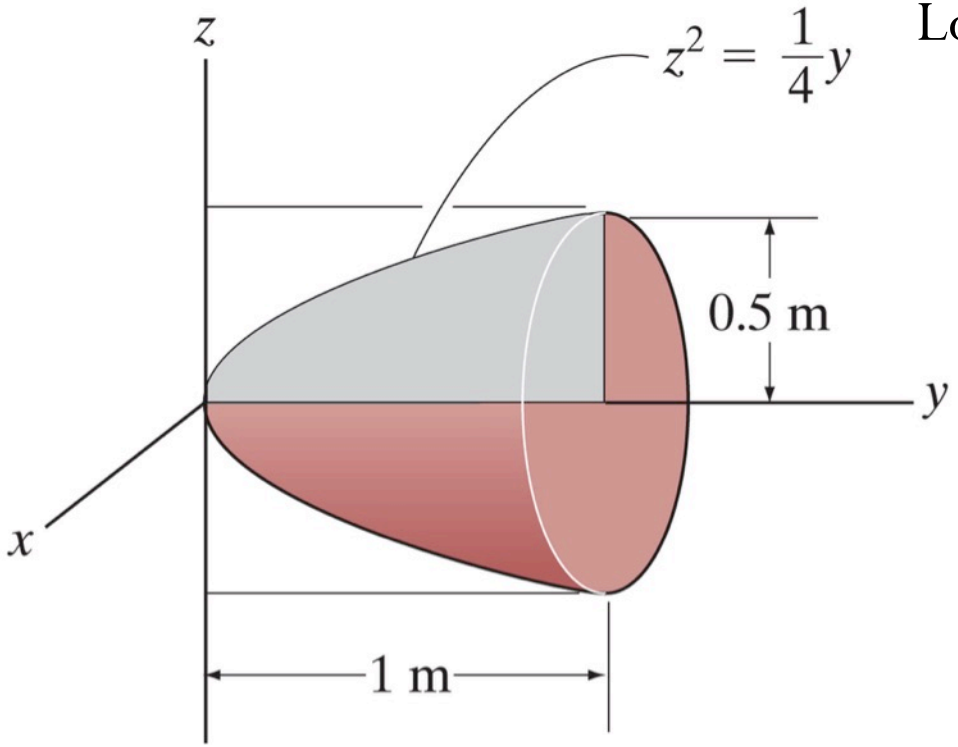
Centroid – Analysis Procedure

1. Select an appropriate coordinate system
2. Define the appropriate element (dL, dA, or dV)
3. Express (2) in terms of the coordinate system
4. Identify any symmetry
5. Express the moment arms (centroid) of (2)
6. Substitute (3) and (4) into the integral and solve

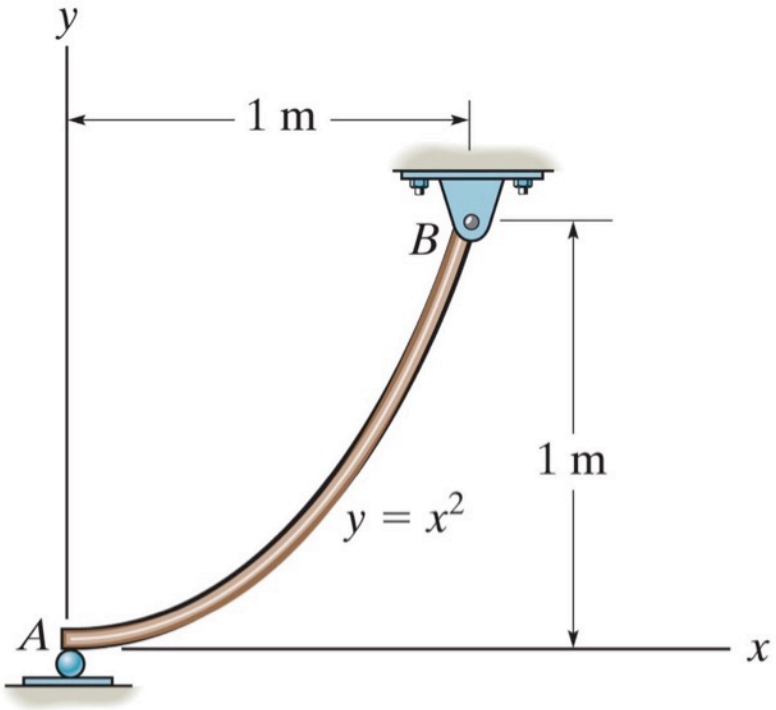




Locate the centroid of the area.



Locate the centroid of the volume.

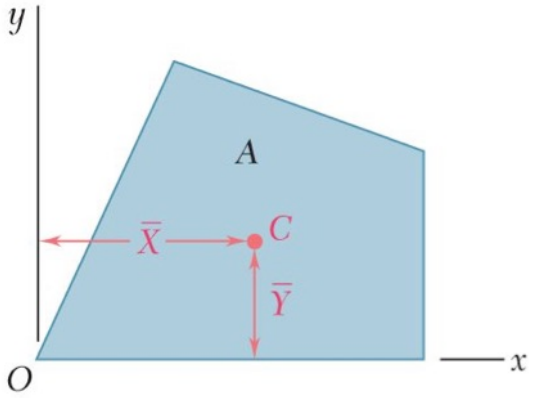


Locate the center of gravity of the homogeneous rod. If the rod has a weight per unit length of 100 N/m, determine the reaction supports at *A* and *B*.

Composite bodies

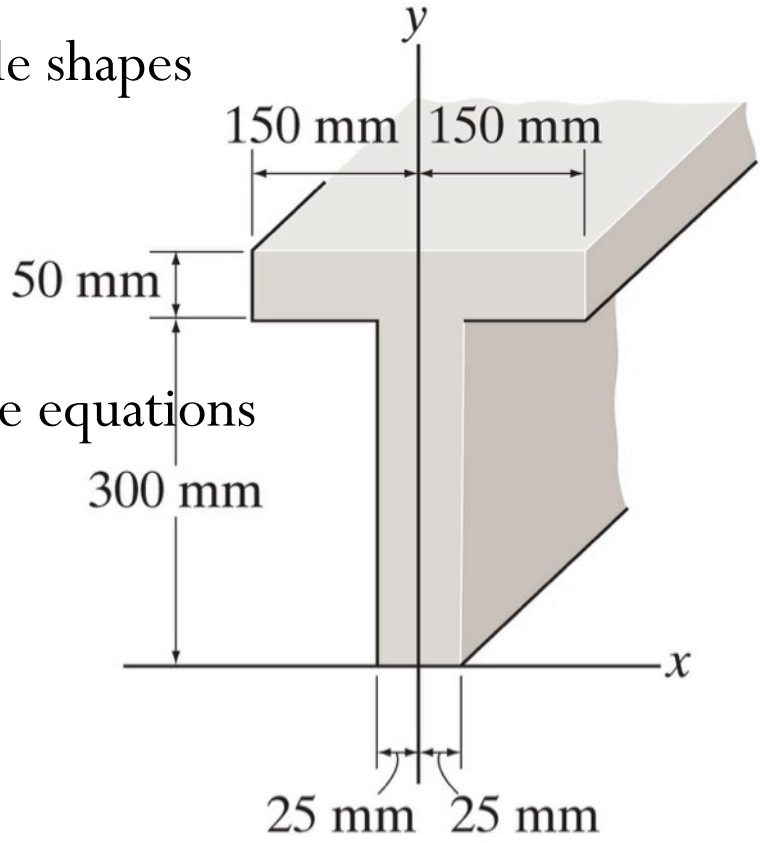
A composite body consists of a series of connected simpler shaped bodies.

Such body can be sectioned or divided into its composite parts and, provided the weight and location of the center of gravity of each of these parts are known, we can then eliminate the need for integration to determine the center of gravity of the entire body.



Composite bodies – Analysis Procedure

1. Divide the body into finite number of simple shapes
2. Consider "holes" as "negative" parts
3. Establish coordinate axes
4. Determine centroid location by applying the equations



$$\bar{x} = \frac{\sum \tilde{x} W}{\sum W}$$

$$\bar{y} = \frac{\sum \tilde{y} W}{\sum W}$$

$$\bar{z} = \frac{\sum \tilde{z} W}{\sum W}$$

Example

Locate the centroid of the cross section area.