Centre of Gravity vs Centroid

Definitions

Centre of Gravity (CG): The point where the entire weight of an object acts, and at which gravity can be considered to apply. CG depends on the distribution of mass and gravity.

$$\bar{x} = \frac{\sum Moments\ of\ Weights}{\sum Weights} \qquad \bar{y} = \frac{\sum Moments\ of\ Weights}{\sum Weights} \tag{1}$$

$$\bar{x} = \frac{\sum Moments\ of\ Volumes}{\sum Volumes} \qquad \bar{y} = \frac{\sum Moments\ of\ Volumes}{\sum Volumes} \tag{2}$$

$$\bar{x} = \frac{\sum Moments\ of\ Areas}{\sum Areas} \qquad \bar{y} = \frac{\sum Moments\ of\ Areas}{\sum Areas} \tag{3}$$

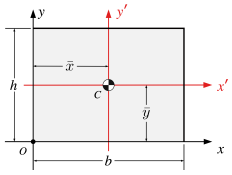
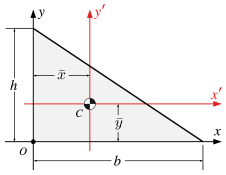
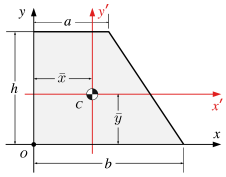
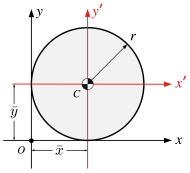
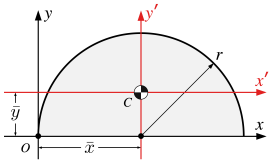
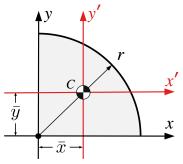
Centroid: The geometric center of a shape or object, determined purely by its geometry and independent of mass or weight distribution. The centroid of a uniform shape coincides with the center of gravity because the mass is evenly distributed.

$$\bar{x} = \frac{\sum \bar{x}_i\ A_i}{\sum A_i} \qquad \bar{y} = \frac{\sum \bar{y}_i\ A_i}{\sum A_i} \tag{4}$$

Properties of Common Shapes

In Table 1, all centroids are measured from the indicated origin. You must make the appropriate adjustments when the origin of your coordinate system is located elsewhere.

Table 1: Centroids of Common Shapes

Shape	Area	$\bar{x}$	$\bar{y}$
	$A = bh$	$b/2$	$h/2$
	$\frac{bh}{2}$	$b/3$	$h/3$
	$\frac{(a+b)h}{2}$	$\frac{a^2+ab+b^2}{3(a+b)}$	$\frac{h(2a+b)}{3(a+b)}$
	πr^2	r	r
	$\frac{\pi r^2}{2}$	r	$\frac{4r}{3\pi}$
	$\frac{\pi r^2}{4}$	$\frac{4r}{3\pi}$	$\frac{4r}{3\pi}$