Definition of Mass Center

The figure depicts a rigid body in two dimensions. The mass center of the body is defined as that point where

\[
\begin{align*}
\int_B r \, dm &= 0 \\
\int_B r' \, dm &= 0 
\end{align*}
\]

A more practical definition of the location of the mass center of a body may be developed as follows:

\[
\int_B p \, dm = \int_B (r' + r_G) \, dm = \left( \int_B d \, dm \right) r_G + \int_B r \, dm = M r_G 
\]

or

\[
\underline{r}_G = \frac{1}{M} \int_B p \, dm
\]

Mass Center – Composite Shapes

For composite shapes, use the tables to determine the mass center locations of common geometric shapes, then compute the location of the mass center of the composite shape as follows

\[
r_G = \frac{\sum_i m_i r_i}{\sum_i m_i}
\]