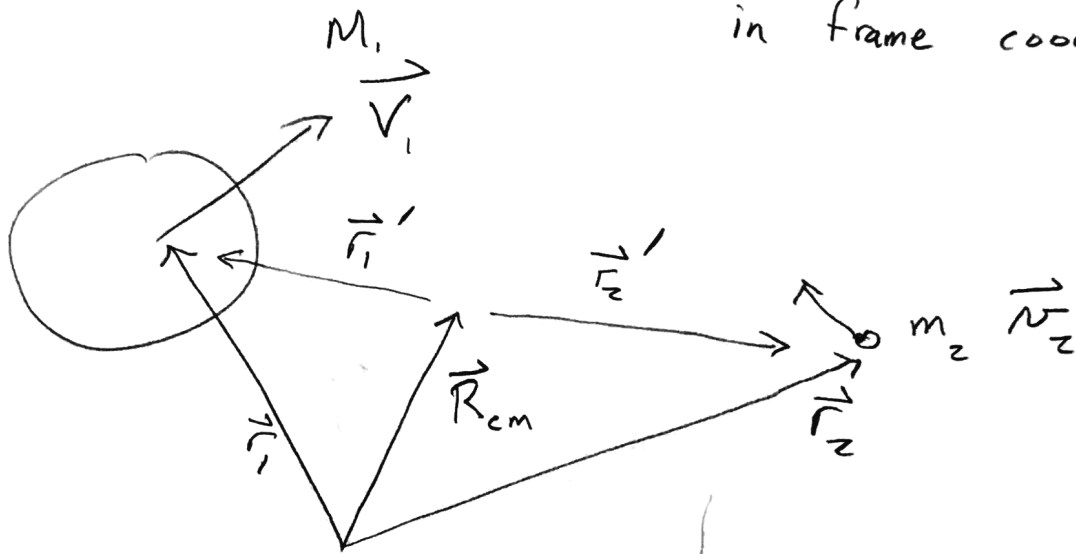
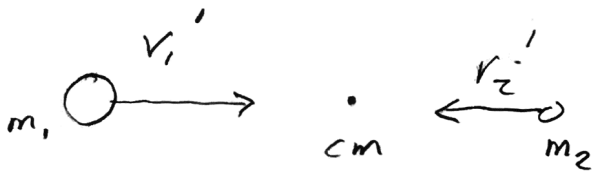


in frame coords:



in C.M. coords



before collision



after collision

$$\vec{R}_{cm} = \frac{m_1 \vec{r}_1 + m_2 \vec{r}_2}{m_1 + m_2}$$

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

$$\vec{r}_1 = \vec{R}_{cm} + \vec{r}_1'$$

$$\vec{r}_2 = \vec{R}_{cm} + \vec{r}_2'$$

$$\vec{v}_1 = \vec{V}_{cm} + \vec{v}_1'$$

$$\vec{v}_2 = \vec{V}_{cm} + \vec{v}_2'$$

$$\left. \begin{aligned} m_1 \vec{v}_1' + m_2 \vec{v}_2' &= 0 \\ m_1 \vec{r}_1' + m_2 \vec{r}_2' &= 0 \end{aligned} \right| \text{C.M. system}$$