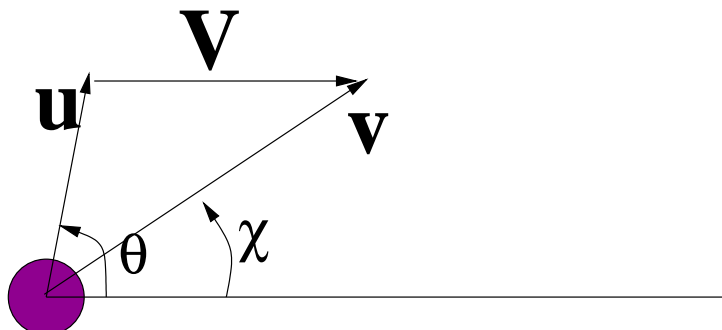


PHY 711 – Assignment #1

August 22, 2006



1. The figure above shows a scattered particle (mass m_1) with velocity \mathbf{v}_{1f} and angle χ_1 as measured in the lab frame and velocity \mathbf{u}_{1f} and angle θ_1 as measured in the center of mass frame with \mathbf{V} denoting the velocity of the center of mass. Assuming that the collision of particle m_1 with the initially stationary particle m_2 is elastic, show that

$$\cos \chi_1 = \frac{\cos \theta_1 + \frac{m_1}{m_2}}{\sqrt{\left(1 + 2\frac{m_1}{m_2} \cos \theta_1 + \left(\frac{m_1}{m_2}\right)^2\right)}}$$

and

$$\tan \chi_1 = \frac{\sin \theta_1}{\cos \theta_1 + \frac{m_1}{m_2}}.$$

2. Derive the corresponding relationships between θ_2 and χ_2 , the angles for the particle of mass m_2 .