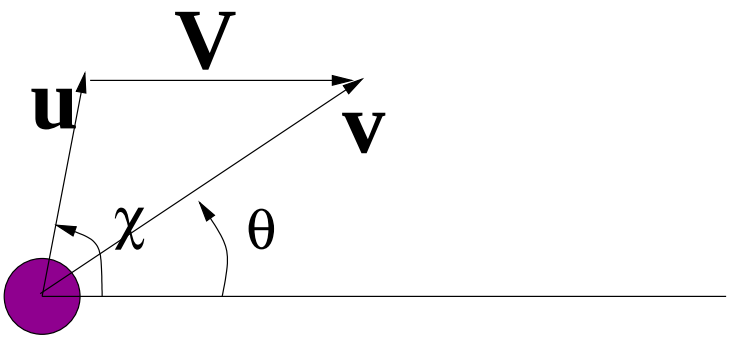
# PHY 711 – Assignment #1

August 24, 2005




1. The figure above shows a scattered particle (mass $m_1$) with velocity $\mathbf{v}$ and angle $\theta$ as measured in the lab frame and velocity $\mathbf{u}$ and angle $\chi$ 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

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

and

$$\tan\theta = \frac{\sin\chi}{\cos\chi + \frac{m_1}{m_2}}$$