

$$\mathbf{r} = y_0^{(q)} \mathbf{y}_{\mathbf{q}} + \mathbf{R}$$

$$y_0^{(q)} = \frac{m_p + m_k}{m_1 + m_2 + m_3}$$

 $y_0^{(q)} = \frac{m_p + m_k}{m_p + m_q + m_k}$