

1 Angular Momentum and Kinetic Energy in the Center of Mass

(Messy algebra) Convince yourself that the expressions for kinetic energy in original and center of mass coordinates are equivalent. The same for angular momentum.

Consider a system of two particles of mass m_1 and m_2 .

- (a) Show that the total kinetic energy of the system is the same as that of two “fictitious” particles: one of mass $M = m_1 + m_2$ moving with the velocity of the center of mass and one of mass μ (the reduced mass) moving with the velocity of the relative position.
- (b) Show that the total angular momentum of the system can similarly be decomposed into the angular momenta of these two fictitious particles.