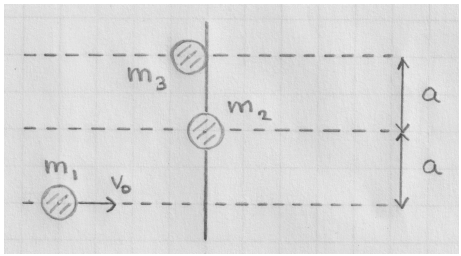
[mex284] Kickback

The compact masses m_1, m_2, and m_3 are free to move along parallel rails as shown. Mass m_2 carries a rod of negligible mass which is free to rotate about its center. Mass m_1 initially moves with velocity v_0 in the direction shown. Masses m_2 and m_3 are initially at rest and the rod is oriented as shown. The contact of mass m_1 with the rod sets the other two masses in motion. All contacts are elastic.
(a) Calculate the velocities v_1, v_2, and v_3 of the three masses after the contacts.
(b) Determine these velocities for the case $m_1 = m_3$ in the limits, (i) $m_2 \to 0$, (ii) $m_2 \to \infty$ and interpret the results thus found.
(c) Determine velocities speeds for the case $m_1 = m_2$ in the limits, (iii) $m_3 \to 0$, (iv) $m_3 \to \infty$ and interpret the results thus found.
(d) Check momentum conservation for the cases (i)-(iv).



Solution: