

Chapter 9:

Floating in a pond is a straight stick of length L with a bug at one end. If the bug walks to the other end of the stick, how far is it from its initial position? Bug mass m_b , stick mass m_s . Friction is negligible between stick and pond surface. Answer: $x_b = m_s L / (m_s + m_b)$.

Blobs of putty of masses m_1 and m_2 move directly toward one another at \mathbf{v}_1 and \mathbf{v}_2 . No external forces act. The two blobs fuse. What is their final velocity \mathbf{v} ? What do you get if $m_1 = m_2$ and $v_1 = 2v_2$?

In the previous collision, what's the ratio K_f/K_i ?

In an elastic, head-on collision with no external forces acting, a ball of mass m moving at \mathbf{v}_0 collides with a mass $3m$ at rest. What are the final speeds of the two balls after collision? Answer: $v_2 = v_0/2$, $v_1 = -v_0/2$.

On a frictionless surface a soft object with speed v_0 and mass m is moving along the y axis toward the origin, while another similar object with the same speed and mass $2m$ is moving along the x axis toward the origin. They collide at the origin and stick together. What is the velocity of the system after

collision? Answer: The final speed is $0.745v_0$ at an angle of 26.6° with the $+x$ axis.

A ball falling vertically strikes a level floor at v_0 and bounce upward at half that speed. What average force acted on the ball during the collision, which lasted time Δt ? Answer:

$$\mathbf{F}_{\text{avg}} = \hat{\mathbf{j}} \frac{3mv_0}{2\Delta t}.$$