Elastic Collisions– Prelab Quiz

Answer these questions after reading the "Elastic Collisions" assignment. Submit your answers via Blackboard as either a MS Word (.docx) or MS Excel spreadsheet file (.xlsx). Be sure to show all of your work so that partial credit can be given.

1. **[5 points]** A mass, m_2, is initially at rest. A mass, m_1, traveling with velocity, v_1, collides with m_2 in an elastic collision. After the collision, the two objects move with final velocities, v_{1f} and v_{2f} respectively. Using the laws of conservation of energy and momentum, show that the ratio of the final velocities in terms of m_1 and m_2 is given by:

$$\frac{v_{2f}}{v_{1f}} = \frac{2m_1}{m_1 - m_2}.$$

2. **[3 points]** Linearize the expression in Exercise 1 by making the following substitutions:

$$y \equiv \frac{m_2}{m_1} \quad \text{and} \quad x \equiv \frac{v_{1f}}{v_{2f}}.$$

   If y is plotted as a function of x, what values do you expect for the slope and intercept?

3. **[2 points]** Based on your result from Exercise 2, what ratio of masses, $\frac{m_2}{m_1}$, results in final velocities, v_{1f} and v_{2f} that are equal in magnitude and opposite in direction?