2016 F=ma Exam: Problem 13

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We study the two limiting cases of a perfectly inelastic collision and an elastic collision which will provide us with the bounds that apply to any generic collision.

For a perfectly inelastic collision, the masses stick together so

$$m_1 v_0 = (m_1 + m_2) v_2$$
$$r_2 = \frac{v_2}{v_0} = \frac{m_1}{m_1 + m_2} = \frac{1}{1+\alpha}$$

For an elastic collision, recall

$$v_2 = \frac{2m_1}{m_1 + m_2} v_0$$
$$r_2 = \frac{v_2}{v_0} = \frac{2m_1}{m_1 + m_2} = \frac{2}{1+\alpha}$$

Thus,

$$\frac{1}{1+\alpha} \le r_2 \le \frac{2}{1+\alpha}$$

so the answer is $\boxed{\text{E}}$.