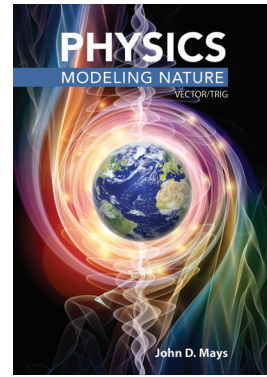


Physics: Modeling Nature

Errata

We always strive to make our textbooks as accurate as possible, but sadly, errors are a reality. We very much appreciate friends who report errata that are not included in this document!

Please send new errata to info@novaescienceandmath.com



Last revised: May 26, 2023

Physics: Modeling Nature (2021)

Chapter 8 Answers

28. $m_1/m_2 = (5 + 2\sqrt{10})/3$

The corrected version of the last part of the solution follows:

$$\frac{1}{2}m_2v_2^2 = 2m_2gr + \frac{1}{2}m_2v_3^2$$

$$v_2^2 = 4gr + gr = 5gr$$

$$v_2^2 = 5gr$$

$$\left(\frac{2m_1m_2\sqrt{2gr}}{m_2^2 + m_1m_2} \right)^2 = 5gr$$

$$8m_1^2m_2^2gr = 5gr(m_2^2 + m_1m_2)^2$$

$$8m_1^2m_2^2 = 5(m_2^4 + 2m_1m_2^3 + m_1^2m_2^2) = 5m_2^4 + 10m_1m_2^3 + 5m_1^2m_2^2$$

$$3m_1^2m_2^2 = 5m_2^4 + 10m_1m_2^3$$

$$3m_1^2 = 5m_2^2 + 10m_1m_2$$

$$3m_1^2 - 10m_1m_2 - 5m_2^2 = 0$$

Divide by m_2^2 to make this a quadratic in m_1/m_2 :

$$3\left(\frac{m_1}{m_2}\right)^2 - 10\frac{m_1}{m_2} - 5 = 0$$

$$\frac{m_1}{m_2} = \frac{10 \pm \sqrt{100 + 60}}{6} = \frac{10 \pm \sqrt{160}}{6} = \frac{5 \pm 2\sqrt{10}}{3}$$

Since $m_1 > m_2$,

$$\frac{m_1}{m_2} = \frac{5 + 2\sqrt{10}}{3}$$