

$$(d) a = \frac{dv}{dt} = \sqrt{\frac{4(m_1 - m_2)g}{M + 2(m_1 + m_2)}} \frac{dh^{1/2}}{dt}$$

$$= \sqrt{\frac{4(m_1 - m_2)g}{M + 2(m_1 + m_2)}} \frac{1}{2} h^{-1/2} v$$

$$= \sqrt{\frac{4(m_1 - m_2)g}{M + 2(m_1 + m_2)}} \frac{1}{2} \cdot \sqrt{\frac{1}{h}} \cdot \sqrt{\frac{4(m_1 - m_2)gh}{M + 2(m_1 + m_2)}}$$

$$= \frac{1}{2} \cdot \frac{4(m_1 - m_2)g}{M + 2(m_1 + m_2)} = \frac{2(m_1 - m_2)g}{M + 2(m_1 + m_2)}$$

$$= \frac{m_1 - m_2}{\frac{M}{2} + (m_1 + m_2)} g$$

It agrees with the result of part (b).

✱