

$$\begin{aligned}
W_{\text{II}} &= -\gamma m M_3 \frac{1 - h / R_3}{R_3 (1 + h / R_3) (1 - h / R_3)} = \\
&= \frac{\gamma m M_3}{R_3} \frac{1 - h / R_3}{1 - (h / R_3)^2} = \gamma \frac{m M_3}{R_3} (1 - h / R_3) = \\
&= -\gamma \frac{m M_3}{R_3} + \gamma \frac{m M_3}{R_3^2} h = W_{\text{II}}(h=0) + mgh. \quad (2.16)
\end{aligned}$$