

76. Energy conservation leads to

$$K_i + U_i = K + U \implies \frac{1}{2}m \left( \sqrt{\frac{GM}{r}} \right)^2 - \frac{GmM}{R} = 0 - \frac{GmM}{R_{\max}}$$

Consequently, we find  $R_{\max} = 2R$ .