Gravitational Potential Energy

SPH-4UI - Tristan Simpson

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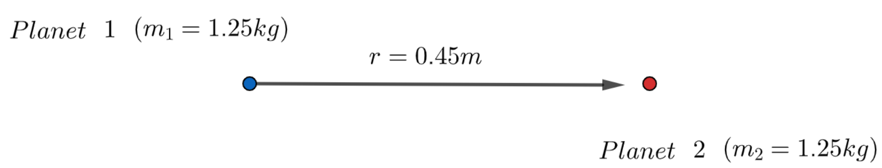
1 Calculations

Formula: $E_g = -\left(\frac{G \times m_a m_b}{r_{ab}}\right)$

Constant: $G = 6.67 \times 10^{-11}\ \frac{Jm}{kg^2}$

Diagram:



Solve:

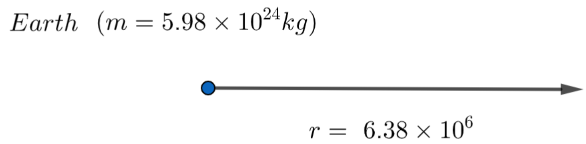
$$E_g = -\left(\frac{G \times m_1 \times m_2}{r}\right)$$

$$= -\left(\frac{(6.67 \times 10^{-11})(1.25)(1.25)}{0.45}\right)$$

$$\approx -2.32 \times 10^{-10} J$$

2 Escape Velocity from Earth

Diagram:



Solve:

$$E_{tot} = E_{tot'}$$

$$E_g + E_k = \cancelto{0}{E_{g'}} + \cancelto{0}{E_{k'}}$$

$$-\left(\frac{G \times m_{shuttle} \times m_{earth}}{r}\right) + \frac{1}{2} m_{shuttle} v^2 = 0$$

$$\therefore V = \sqrt{\frac{2(G \times m_{shuttle} \times m_{earth})}{r m_{shuttle}}}$$

$$= \sqrt{\frac{2(G \times m_{earth})}{r}}$$

$$= \sqrt{\frac{2((6.67 \times 10^{-11})(5.98 \times 10^{24}))}{(6.38 \times 10^6)}}$$

$$\approx 11.2 \frac{km}{s}$$