

Thomas-Palmer Physics In-Class Lecture Notes:

We Moved The Earth!! But How Far? An application of Newton's 3rd Law
 Thank You, Amanda Ciccarelli, for these notes.

We moved the Earth But How Far?

$$F_{cv} = F_g = mg \quad m_v = (28)(65)$$

$$m_v = 1820 \text{ kg} \quad v_{ic} = 0$$

$$F_{cv} = (1820)(+9.8) \quad F_{cv} = 17836 \text{ N down}$$

$$F_{uc} = -F_{cv} \quad F_{uc} = -17836 \text{ N down} \quad F_{uc} = 17836 \text{ N up}$$

$$\Sigma F_{\text{earth due to us}} = F_{uc} = m_e a_c \quad m_e = 5.98 \times 10^{24} \text{ kg}$$

$$a_c = \frac{F_{uc}}{m_e} = \frac{17836}{5.98 \times 10^{24}} = 2.98260 \times 10^{-21} \text{ m/s}^2$$

US

$$a_y = -9.8 \text{ m/s}^2 \quad -0.77 = \frac{1}{2}(-9.8)\Delta t^2$$

$$v_{iy} = 0 \quad \Delta t = 0.39612 \text{ s}$$

$$\Delta y = -0.77 \text{ m} \quad \Delta y_c = v_{ic}\Delta t + \frac{1}{2}a_c\Delta t^2$$

$$\Delta t = ? \quad \Delta y_c = \frac{1}{2}(2.98260 \times 10^{-21})(0.39612)^2$$

$$\Delta y = v_{iy}\Delta t + \frac{1}{2}a_y\Delta t^2 \quad \Delta y_c = 2.34247 \times 10^{-22} \text{ m} \approx 2 \times 10^{-22} \text{ m}$$

$$\Delta y_{\text{earth}} = 0.000000000000000000000002 \text{ m}$$