(c) (3 pts) What is the horizontal velocity of the bar immediately after take off? Show your work and use proper units and signs.

\[ v_{x,\text{bar}} = \frac{p_{x,\text{bar}}}{m_{\text{bar}}} = \frac{-0.1}{-15} = -0.0067 \text{ m/s} \]

(d) (5 pts) What is the kinetic energy of the bar immediately after take off? Show your work and use proper units.

\[ K_{\text{bar}} = \frac{1}{2} m_{\text{bar}} (v_{x,\text{bar}})^2 = \frac{1}{2} (0.15)(0.67)^2 \]

\[ = 3.3 \times 10^{-2} \text{ Joules} \]

(e) (5 pts) How high will the base of the swing (bar) rise above its original level after the bird takes off? Show your work and use proper units.

\[ \text{height} = 0.0227 \text{ m} = 2.27 \text{ cm} \]

\[ mgh = \frac{1}{2} m v^2 \quad \Rightarrow \quad gh = \frac{1}{2} v^2 \quad \Rightarrow \]

\[ h = \frac{\frac{1}{2} v^2}{g} = \frac{(\frac{1}{2})(0.67)^2}{9.8} = 0.0227 \text{ m} \]

\[ = 2.27 \text{ cm} \]