Work and Energy
PHYS 2425

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October 2, 2025

1. Problems

1. A block of mass m_1 is resting on top of another block of mass m_2. To cause the top block to slip on the bottom one while the bottom block is held fixed, a force of at least $\vec{F}$ must be applied to the top block. These blocks are placed on a table with coefficient of friction μ. What is the maximum horizontal force, $\vec{J}$, that can be applied to the lower block without the top block slipping.

$$J = (m_1 + m_2)(\frac{\vec{F}}{m_1} + \mu g)$$

2. A block of mass m is resting on a hill at angle θ. It falls a distance L down the hill before hitting a spring at rest with spring constant k. What distance x does the spring constant get compressed by? Assume no friction.

Define the stopping point to be 0 potential energy. So the total change in PE is mgh $= mg \sin L + x$. Setting this equal to the final spring energy yields:

$$x = \frac{mg \sin\theta \pm \sqrt{[mg \sin\theta]^2 + 2kmgL \sin\theta}}{k}$$