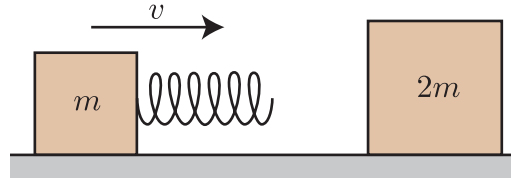
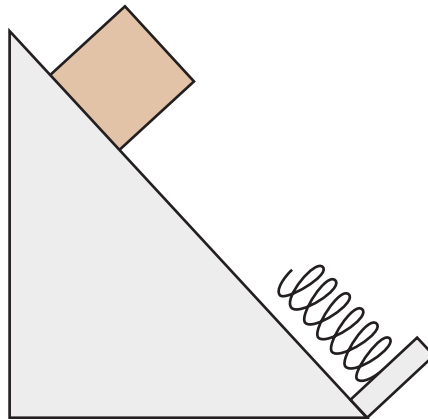


Physics 161 Sample Midterm 3

1. A block of mass m has a spring with spring constant k attached as shown below. The block is initially sliding on a horizontal frictionless surface with speed v . The block collides with a block of mass $2m$.



- (a) (7 points) Is momentum conserved in the collision? Explain.
- (b) (7 points) Is energy conserved in the collision? Explain.
- (c) (19 points) Find the maximum compression of the spring during the collision.
2. (33 points) A block of mass 2.0 kg slides down an inclined plane that makes a 55° angle with the horizontal. The coefficient of kinetic friction between the block and the plane is $\mu_k = 0.33$. At the bottom of the incline, a spring with spring constant 120 N/m stops the downward slide of the block. Find the height from which the block must be released in order that the spring compresses by 0.10 m when the block is momentarily at rest.



Problem 3 is on the back of this page.

3. (33 points) Planet X has surface gravity $g_X = 3.5 \text{ m/s}^2$. It has a giant ice-covered volcano whose vertical height is equal to the radius of the planet $R_X = 5.3 \times 10^6 \text{ m}$, and whose slope is 70° . A space sled slides from the top of the mountain. Find its speed at the bottom if we neglect air resistance and friction. (You do *not* need to know G or the mass of the planet in this problem.)

