1. \( m_p = 0 \text{ kg} \)
   \( m_A = 5 \text{ kg} \)
   \( m_B = 10 \text{ kg} \)
   No friction

   If starting from rest,
   a) What is the acceleration of the system?
   b) What is the velocity of \( B \) after \( t \) seconds?
   c) What is the velocity of \( A \) after \( t \) seconds?
   d) Redo c) using energy (for good karma).

2. \( m_A = 20 \text{ kg} \)
   \( m_B = 5 \text{ kg} \)
   \( \mu_s = 0.5 \)
   \( \mu_k = 0.2 \)
   \( \theta = 30^\circ \)

   If starting from rest, \( A \) slides down the incline plane for 2 meters, what is then its velocity?

3. \( m = 5 \text{ kg} \)
   \( h = 2 \text{ m} \)
   No friction

   How high does \( m \) go up the incline?

   \( \mu_s = 0.7 \)
   \( \mu_k = 0.5 \)
4. \(h = 3 \text{ m}\)

\(d = 5 \text{ m}\)

\(k = 100 \text{ N/m}\)

\(\mu_s = 0.7\)

\(\mu_k = 0.5\)

\(m = 5 \text{ kg}\)

By how much does the spring compress?

5. \(d = 2 \text{ m}\)

\(\mu_s = 0.5\)

\(\mu_k = 0.2\)

\(m = 5 \text{ kg}\)

\(\Delta x = 0.5 \text{ m}\)

\(\theta = 30^\circ\)

\(m\) is standing from rest, slides down and compresses the spring by \(\Delta x\) before stopping. What is \(k\)?

6. \(k = 100 \text{ N/m}\)

\(\text{length of spring, uncompressed: 2 m}\)

\(\text{length of compressed spring: 0.5 m}\)

\(d = 2 \text{ m}\)

\(m = 5 \text{ kg}\)

Standing from rest, \(m\) will slide up the ramp due to the compressed spring. As it leaves the ramp (where there is friction \(\mu_s = 0.9, \mu_k = 0.7\))
it will follow a projectile motion style. Find y (max height) and x (range).

No friction.

This is a question from the book. If the object is a ray or a string to slide down the surface (semi-circle) it will eventually leave the surface at point B. Find the angle $\theta$ at which this occurs.

Unstretched position

Stretched new position

from this new position (after), the block is released from rest and is going to slide back to its unstretched position $x_1$. As it slides back to the position of $x_1$, it is subjected to the

friction force.
What is the work done by ALL forces from the position $t_2$ back to position $t_1$?

\[ W = \int_{t_2}^{t_1} F \cdot ds \]

Where:
- $F$ is the forces acting on the object.
- $ds$ is the displacement.

\[ W = \int_{t_2}^{t_1} (F_x \cos \theta + F_y \sin \theta) \, ds \]

Parameters:
- $F_x$ and $F_y$ are the horizontal and vertical components of the force, respectively.
- $\theta$ is the angle the force makes with the horizontal.
- $ds$ is the displacement along the path.
- $W$ is the work done.

**Equations:**
- $F_s = kx$
- $P = 200 \text{ N}$
- $m = 5 \text{ kg}$
- $W$: weight
- $N$: normal force (unknown magnitude)
- $s = 50 \text{ m}$

\[ W = \int_{t_2}^{t_1} (F_x \cos \theta + F_y \sin \theta) \, ds \]