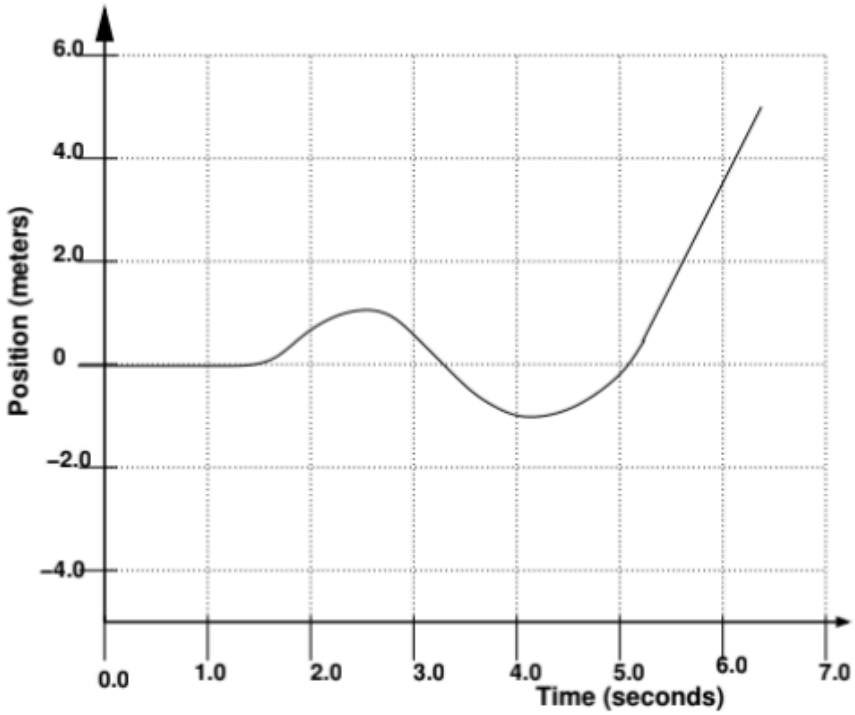
PHYS 121 SI- Exam 1 Summary Session!

By the end of this session students should be able to:

- Describe the relationship between position, velocity, and acceleration
- Draw FBDs and use them to find the magnitudes & directions of forces
- Understand the conditions for Conservation Laws and apply them
- Ace the exam :)



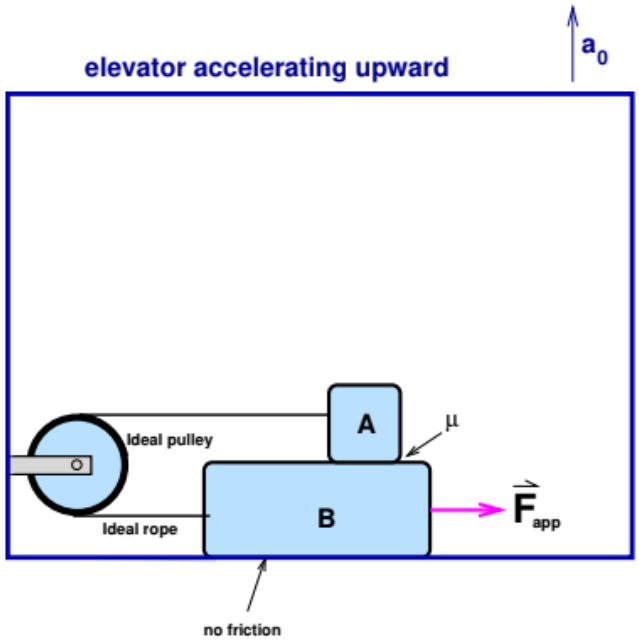
The above plot shows the 1-D position of a particle as a function of time. Please answer these questions about the motion of the particle.

a) Are there any times during the motion when the particle is instantaneously at rest. Please clearly indicate these times by putting an "X" on them. Please explain how you determined this.

b) Are there any times during the motion when the velocity is constant. Please clearly indicate these times by putting an "O" on or around them. Please explain how you determined this.

c) What is the *maximum speed* the particle obtains during this motion? Please explain how you determined this.

Problem X03: Blocks, Pulley, Elevator – Straight from 2011 First Hour Exam:



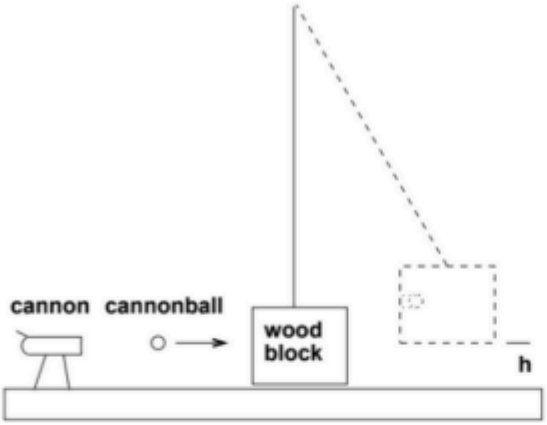
Two blocks A and B with a given masses m_A, and m_B respectively, are positioned as shown above. Block A is observed to be *sliding* on Block B. The coefficient of kinetic (sliding) friction between Block A and Block B is given as μ. The pulley is an ideal massless pulley. The ropes are ideal. A given force $\vec{F}_{app}$ is applied to the right on Block B. The entire arrangement sits inside an elevator that is accelerating upward with a constant given acceleration, a_0.

Part (a) – Draw two clear, clean, and properly labeled "Free-Body Diagrams" (FBDs), one for each block, indicating *all* of the forces on each body.

Part (b) – Using your FBD and Newton's Second Law, determine N_{AB}, the magnitude of the normal force on Block A due to Block B. Express your answer in terms of the given parameters only. Explain your work.

Part (c) – Using your FBD and Newton's Second Law, determine N_{BE}, the magnitude of the normal force on Block B due to being in contact with the elevator. Express your answer in terms of the given parameters only. Explain your work.

Part (d) – Rather More Difficult: Using your FBD and Newton's Second Law, determine the force of Tension in the rope. Express your answer in terms of the given parameters only. Explain your work.



A cannon is fixed to a solid platform and fires a cannonball with mass m_c at a velocity V_0. The cannonball collides with a large wooden block (mass m_b) and becomes completely embedded inside the block. The block is suspended on an ideal rope and swings upward to a height h above its resting point.

a) Find the speed of the wood block after the cannonball is completely embedded in the block.

b) Find the maximum height h that the block will reach in terms of the given parameters.

c) What is the total work done on the cannonball by the canon?

d) What is the work done on the block by the tension force as it rises to the maximum height?

e) What is the work done on the cannonball by the force of gravity as it rises to the maximum height?

f) Is the total mechanical energy conserved during the collision between the cannonball and the block?

GOOD LUCK EVERYBODY!! YOU GOT THIS!