Name: _____ Date: _____ Course: _____ Professor: _____

M16b Prelab: Newton's Second Law

Read the lab instructions and the appropriate sections from your textbook before answering the questions.

Answer the questions listed below. ***Your answers must be typed, equations and derivations can be handwritten.***

1) Newton's Second Law relates the acceleration of an object with its mass and the net force acting on the object.
   a) Explain the meaning of a term "net force".

   b) Explain the meaning of mass according to the Newton's Second Law.

2) Explain what is called a "kinematical acceleration" in this lab.

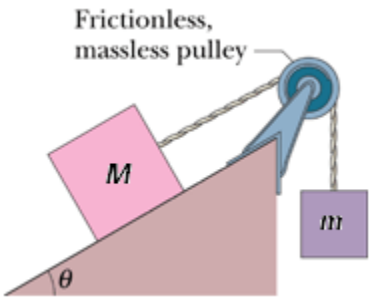
3) Explain what is called a "dynamical acceleration" in this lab.

4) Using your lab handout, identify what are "**d**" and "**h**" in the experiment. If **d=1.00 m**, and **h=1.35 cm**, what is the angle of incline θ? Show your work!

5) In this lab, when you will increase the angle of incline θ, how this will affect the acceleration of the cart? Explain!

6) Derive the expression for the acceleration of two blocks connected by a rope as shown below using Newton's second law of motion. Ignore friction. Follow the steps below:
   a) In the figure below, draw free-body diagrams for **M** and **m**, indicating all forces acting on each block.
   b) Apply Newton's Second Law to both masses and setup two equations with two unknowns (one for **M** and one for **m**).

c) Solve this system of equations, taking into account that magnitudes of the acceleration of both blocks are the same. Show work!



Your final equation should be: **a=(mg-Mgsinθ)/(m+M)** . You are going to use this equation to calculate the dynamical acceleration in the lab.

7) How are you going to calculate the net force on the cart in this experiment?

8) Describe the graph you will have to plot using the data you'll collect it the lab. Include which physics quantities will be displayed on y- and x-axis, what is the expected shape of the graph and why, which trendline you will use to analyze your graph, and how you are planning to find the mass of the cart using parameters of the best fit line obtained by a computer analysis.