Name: _____ NetID: _____

NYU Physics I—Term Exam 2

Problem 1: (from Lecture on 2018-09-27) A roller-coaster cart is at the top of a loop-the-loop (and therefore upside-down). The trajectory of the center of mass of the cart has a radius of curvature $R = 5\,\mathrm{m}$. How fast does the roller-coaster have to be moving in $\mathrm{m\,s^{-1}}$ to stay on it's proper path (that is, on the tracks)? Assume the mass is $M = 1000\,\mathrm{kg}$ and the acceleration due to gravity is $g = 10\,\mathrm{m\,s^{-2}}$.

Problem 2: (from Lecture on 2018-09-25) In *16 words or fewer* tell me why the mass flying off the (not a) aki jump didn't fly all the way back up to the release height. Put a box around your answer, so I can count the words!

Problem 3: (from Problem Set 3) If a runner, starting at rest, accelerates at $5\,\mathrm{m\,s^{-2}}$ for $2\,\mathrm{s}$ and then continues at constant speed for $19\,s$ more, how far will she have run at the end of that $21\,\mathrm{s}$?

Problem 4: (from Problem Set 4) What is your kinetic energy when you are walking along the street? State your assumptions, and make sure they are *reasonable.*

Problem 5: (from the blocks-and-pulleys worksheet) A massless pulley hangs from the ceiling from a string which is at tension T_1. Over this pulley is another string at tension T_2, on the ends of which are massive blocks attached. What is the relationship between T_1 and T_2? If you have to assume additional things to solve this problem, state them.

Problem 6: (from the friction worksheet) You have a block of mass m on an inclined plane, inclined at an angle $\theta = 15\,\text{deg}$ to the horizontal. The coefficient of friction is $\mu = 0.9$. What is the magnitude of the frictional force on the block? The acceleration due to gravity is g. You can leave your answer in terms of μ, m, g, θ, or whatever you need to deliver a correct answer. Once again, state any assumptions you need to make.