Name: _____ NetID: _____

NYU Physics I—Term Exam 2

Problem 1: (From Lecture on 2017-09-28.) In Roller-Coaster Design School, we considered a cart going over a hill with radius of curvature R. We said it would be bad if $v^2 > R\,g$. What would happen if $v^2 > R\,g$?

Problem 2: (From Lecture on 2017-10-03.) In a one-dimensional problem, a 3 kg block moves to the right at $2\,\mathrm{m\,s^{-1}}$, and a 5 kg block moves to the left at $1\,\mathrm{m\,s^{-1}}$. Choose a coordinate system and tell me the total momentum of the system in that coordinate system.

Problem 3: (From Problem Set 3.) Imagine a runner who starts at rest, and then accelerates at constant acceleration, and then runs at a constant velocity, all in the x direction. She starts at rest, accelerates at $5\,\mathrm{m\,s^{-2}}$ for $0 < t < 2\,\mathrm{s}$ and then goes at constant speed for $2 < t < 12\,\mathrm{s}$. How far does she go in these 12 s?

Problem 4: (From Problem Set 4.) What is your kinetic energy when you are walking down the street? Make reasonable assumptions about your mass and velocity and anything else you need to assume. Give your answer in SI (standard metric) units.

Problem 5: (From 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 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 $\mu = 0.5$. What is the magnitude of the frictional force on the block? The acceleration due to gravity is g. Once again, state any assumptions you need to make.