

Problem Set #4 due beginning of class, Monday Oct. 9. Please state the lens you are using and why. Remember that you will be graded on your communication of physics understanding.

1. Exercise 1 in 3.0
2. Dragsters have a mass of about 1000 kg and the best dragsters get to 44 m/s in about 0.8 s.
  - a) What's the acceleration?
  - b) Estimate the coefficient of friction necessary to make this happen if you were in a regular car on flat ground.
  - c) What's the average power output during this 0.8 s?
  - d) Dragsters have their exhaust pipes pointed *upwards*, which ejects a huge amount of exhaust straight up into the air at very high velocity. What effect does this thrust have on the ability of the car to accelerate? *Why? Please start with clarification of reasons, drawings, lenses.*  
According to my calculations, the engines kick out about 18 kg of exhaust every second at about 230 m/s.
  - e) What is the momentum of this amount of gas?
  - f) How much force should this put on the vehicle? In which direction?
  - g) With this extra "downforce", what coefficient of friction is necessary in order to accelerate the dragster?
3. How fast was the ball thrown Thursday in Class?
4. Exercise 2, in 3.1, What are the final velocities in this elastic collision?
5. From Big Exam! #3:  
There is a 2 kg rubber block resting on the level ground. The coefficients of friction between the block and wooden floor are 0.7 and 0.5 for static and dynamic, respectively.
  - a) You want to slide the block horizontally, so you push on it with a force of 12 N westward. What is the acceleration of the block (include direction).
  - b) Then you push the block westward with a force of 16 N. What is the acceleration of the block (include direction).
  - c) If you push the block westward for with a force of 16 N for 2 meters, find the amount of work you do and the heat liberated in the process.
  - d) If you push the block westward for with a force of 16 N for 2 meters, find the final speed of the block.