Homework 1: Due Feb 10 2006, in class. (or turn it in before then to your TA's mailbox, 5th floor, Sterling Hall). Show your work for partial credit if you make an arithmetic error. If you run out of room, please use the back of this sheet for your answers.

1. (30%) A rocket works by pushing some of its own mass out a nozzle using a controlled explosion. Suppose you are a rocket pilot at rest in empty space, and you wish to maintain a constant acceleration for 4 minutes. To achieve this, does the force applied to the exhaust (the "thrust") have to remain constant, increase, or decrease during this period? Explain your answer using all three of Newton's laws of motion. Be sure to explain why the rocket accelerates at all.

2. (25%) Suppose you were on a planet with exactly the same mass as the Earth but twice the Earth's radius. How would your weight on that planet compare with your weight on Earth? How would your mass compare on the two planets?

3. (25%) There are several things wrong with this diagram of a planet’s orbit:

![Diagram of a planet’s orbit]

Draw a correct picture. Mark also the point where the planet is moving fastest in its orbit and where it moves slowest.

4. (20%) Red light; blue light; X-rays; radio waves; gamma rays
   a) which has the longest wavelength?
   b) which has a wavelength closest to 700 nm?
   c) which has the highest frequency?
   d) which has the highest speed?