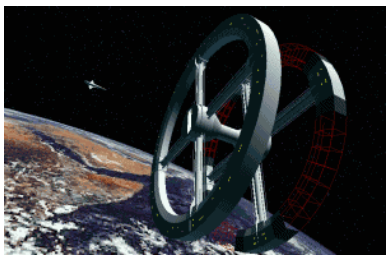
DAY 7 -- PHY 231 ONLY

Homework Assignment (see syllabus for homework collection information)

1. The table at right gives speed and time data for an experimental unmanned aircraft that has a mass of 5000 kg. Obtain an equation for speed as a function of time, and use that equation to get an equation for Power as a function of time. Make a graph of power vs. time and discuss what happens to the power output of the aircraft.

Time (s)	Speed (m/s)
0	0
0.5	71
1	100
1.5	122
2	141
2.5	158
3	173
3.5	187
4	200
4.5	213
5	226
5.5	239
6	252
6.5	265
7	278
7.5	291
8	304
8.5	317
9	330
9.5	343
10	356

2. For the above problem, find an equation for acceleration as a function of time. Graph and discuss this equation.



At a space station (no gravity) a rocket is being prepared for a test. The rocket has mass 10,000 kg, of which 9500 kg is fuel. The rocket engine is started, consuming fuel at a rate of 2.5 kg/sec. The thrust generated by the rocket is 5000 N. The crew on the station measures the rocket's flight…

3. Make a graph of speed vs. time for this rocket, ignoring fuel consumption. Then, on that same graph sketch an estimate of how the speed of the rocket will vary with time if you include fuel consumption.

4. In the above problem, will the acceleration of the rocket when it is first launched be simply 0.5 m/s^2? Explain why, as its fuel is running out, the rocket's acceleration must be substantially greater than 10 m/s^2.

5. Make a graph of acceleration vs. time for this rocket, ignoring fuel consumption. Then, on that same graph sketch an estimate of how the acceleration of the rocket will vary with time if you include fuel consumption.

6. In problems 3 and 5 you estimated. These graphs can be obtained exactly or nearly exactly using a spreadsheet or a high-powered calculator or just excellent calculus skills. Obtain them. (HINT -- This is a very tough problem.)