Homework assignment 2

2.1 Compare the exact solution for the velocity as a function of time without air resistance with the numerical results in Figure 2.1 and show that they agree.

2.3 Estimate the effect of the Stokes term ($-B_1 v$ term). This term, neglected in all of the previous discussions, represents *viscous drag*, that is, the dragging of air by the moving bicycle due to the viscosity of air. The viscosity, η, is usually, defined for a fluid contained between two parallel plates of area A by

$$F = \eta A \frac{\partial v}{\partial z}$$

Where F is the drag force and z is the transverse coordinate. As a rough approximation, let us replace $\frac{\partial v}{\partial z}$ by $\frac{v}{h}$ where h is the height of the bicycle plus the cyclist. For air, $\eta \simeq 2 \times 10^{-5}\,\mathrm{Pa \cdot s}$.

2.8
In our model of the cannon shell trajectory we have assumed that the acceleration due to gravity, g, is a constant. It will, of course, depend on altitude. Add this to the model and calculate how much it affects the range.
Include the adiabatic approximation in your code.