P5

The assert at the end of the get bc method acts as a fail switch for the code in the case where a user enters boundary conditions which are neither smooth nor periodic. In this case, the given boundary conditions not satisfying the smooth and periodic conditions will then loop over these and then reach the assert statement which will fail thus terminating the code which would otherwise have had continued to run thus potentially leading to wrong results. It is the equivalent of adding an error message to terminate a program which has malfunctioned.

P6

Each pulling point is a distance dx away from the central point, hence, the net pulling effect is 2 dx since there is pulling from both the left and right neighbours in order to get the derivative which is why we need to divide by 2 dx rather than dx when we calculate the derivative.

Bonus2

The time step calculator is given by c_s=numpy.sqrt(self.gamma*self.P/self.rho)