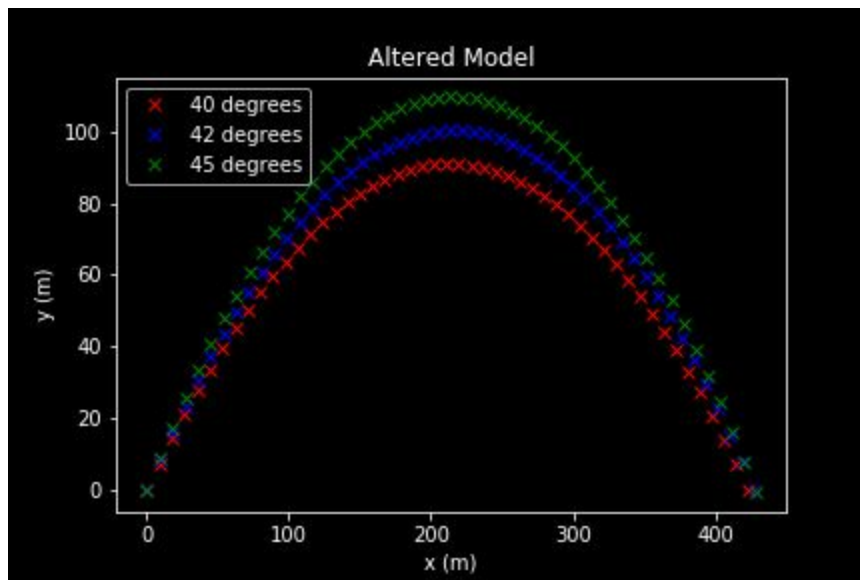


Q1:

For code see other attachments.

As expected, the reduced effects of air resistance allow a higher maximum height to be attained as well as a larger range. Furthermore, decreasing air resistance makes this situation more closely resemble the case without air resistance as the maximum range occurs closer to 45 degrees than in the case with air resistance proportional to  $v^2$ . The results of this altered model are depicted below:



Q2:

We define converge as the error eventually decreasing towards 0 over repeated iterations. This discounts any  $p > 1$  for the parameters given from lecture 15 (where  $p$ ,  $\delta$  and  $n_{\max}$  are allowed to vary) as they tend to infinity in these cases. The divergence of  $du$  can be seen by debugging and watching the value of  $du$  upon repeated iterations. Therefore we have  $\forall p$ ,  $p \in (0, 1)$ . Choosing  $p$  starting from 0.1 and increasing in steps of 0.1 gives the following output:

Convergence found after 710 iterations  
Convergence found after 696 iterations  
Convergence found after 741 iterations  
Convergence found after 822 iterations  
Convergence found after 935 iterations  
Convergence found after 1086 iterations  
Convergence found after 1289 iterations  
Convergence found after 1561 iterations  
Convergence found after 1897 iterations  
Convergence found after 1 iterations

In the case of  $p=1$  we have that  $q=0$  so the updates effect is very minimised, this gives a  $du$  of 0 which means no further iterations occur. In light of that the best  $p = 0.2$ .

The modified source code that gives this output is also attached.