PHY407: Lab 7

Date: October 29th. 2021

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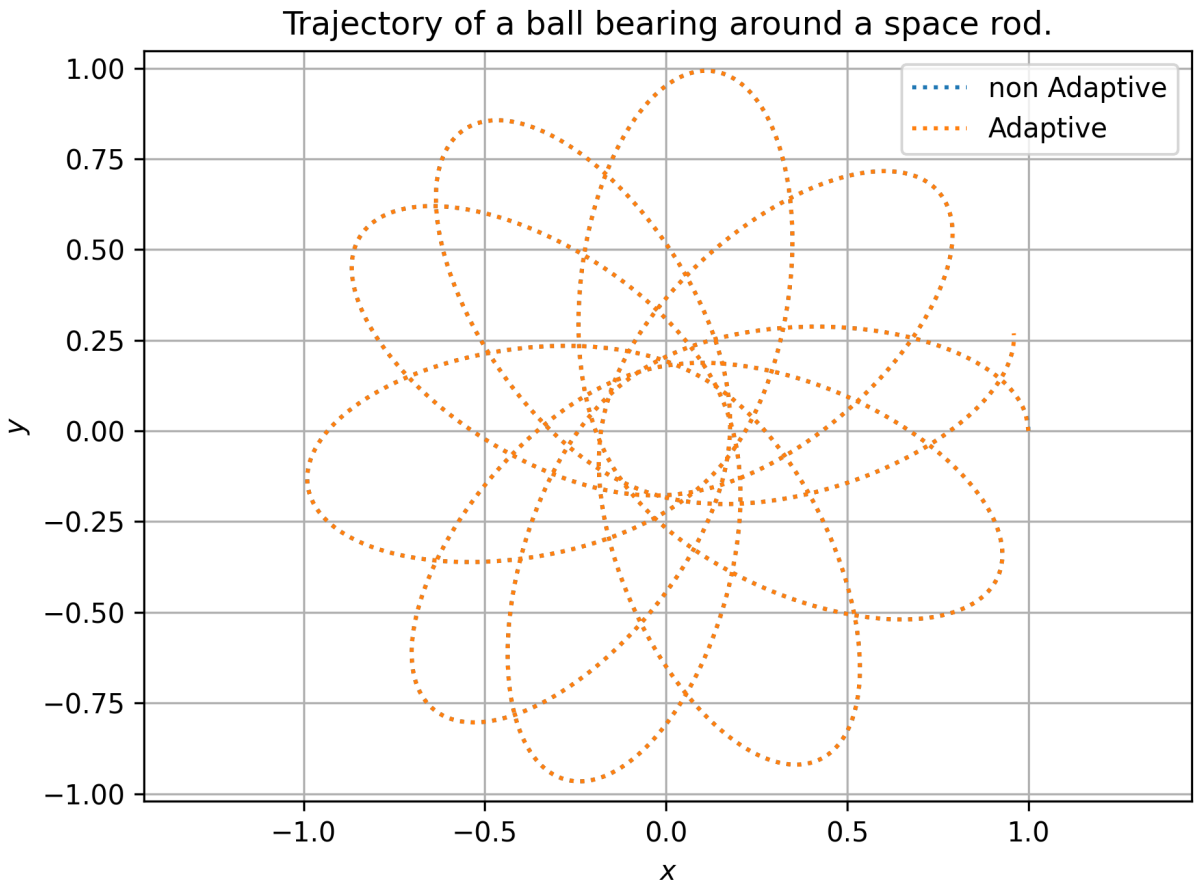
Contributions:

- Q1. Brendan Halliday
- Q2. Brendan
- Q3. Nikolaos Rizos

Q1.a.

Here is the plot:



Here we see perfect overlap.

Q1.b.

Here is the output for the times

Time for non-adaptive method:
0.5235981941223145 s

Time for adaptive method:
15.640127897262573 s

Q2.a.

The energy levels for the first three levels are:

E0 = 138.02397203057728 eV
E1 = 414.07191644593837 eV
E2 = 690.1198601173364 eV

Which are close to the analytical solutions.

Q2.b.

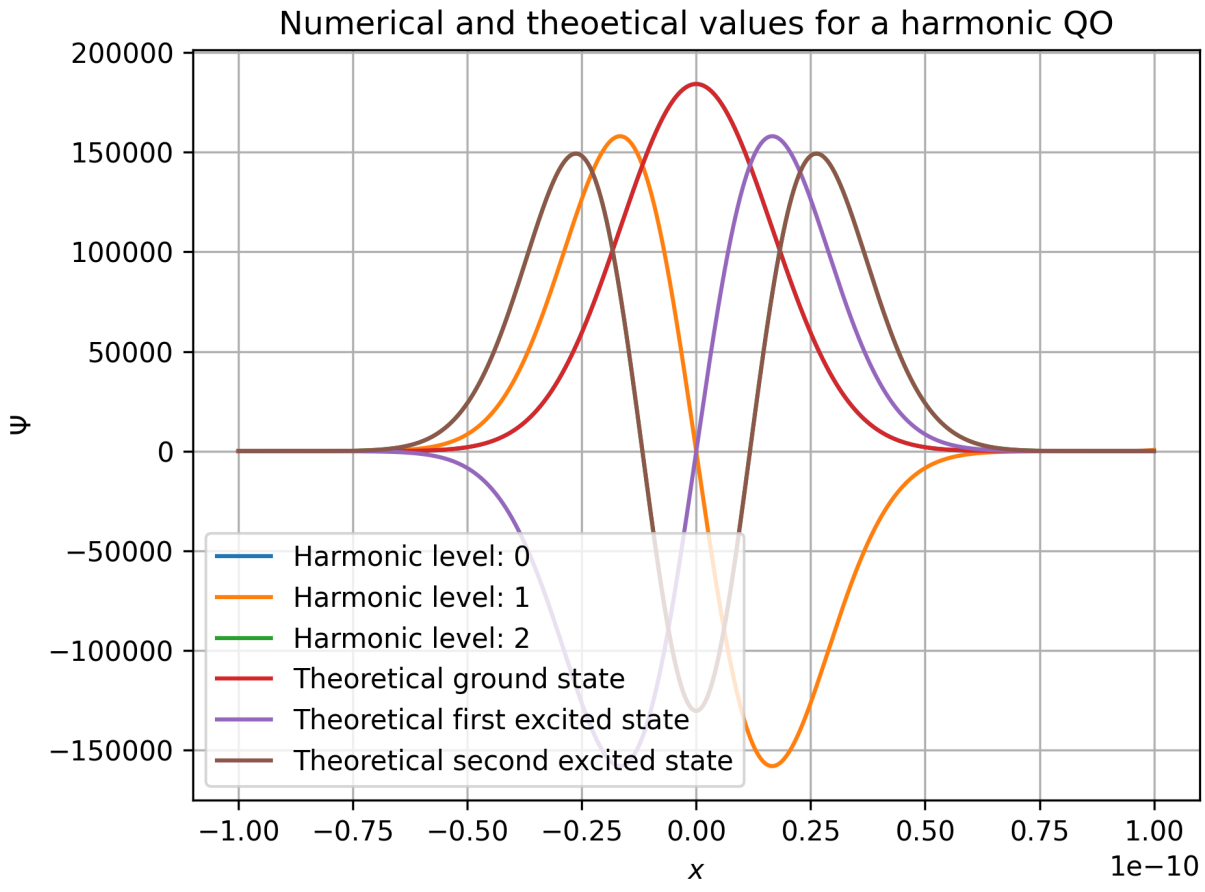
The energy levels are:

E0 = 150.4176415631335 eV
E1 = 460.65402734782435 eV
E2 = 700.0011543538398 eV

To be honest, I'm not sure if these are right. I did not have enough time to investigate further.

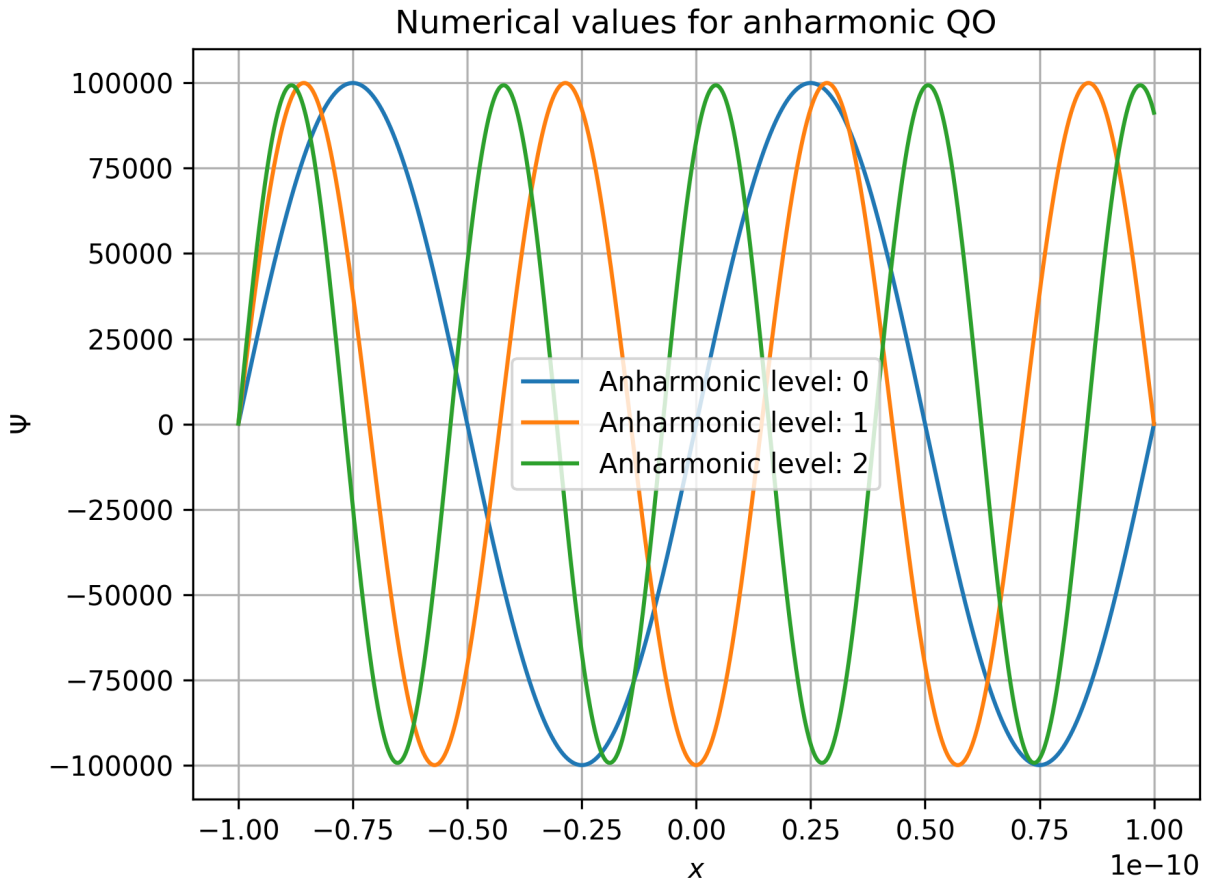
Q2.c.

Here are the plots for the harmonic functions:



The first excited state is flipped which is wrong. Unfortunately I did not have enough time to investigate.

Here is the plot for the anharmonic case:



This doesn't make sense especially for the second excited level since it should die off.

Q3.

See code for work.