

BioPhys 3G03 – Assignment 2 – Jatin Chowdhary – February 10th 2022

Question 1)

The values for dt and E , for each iteration are:

$dt = 1, \quad E = 3732.024788888908$

$dt = 0.5, \quad E = 1840.7019239566425$

$dt = 0.2, \quad E = 750.6918114293936$

$dt = 0.1, \quad E = 388.86996433102297$

$dt = 0.05, \quad E = 197.83494025608798$

$dt = 0.02, \quad E = 79.95652797514977$

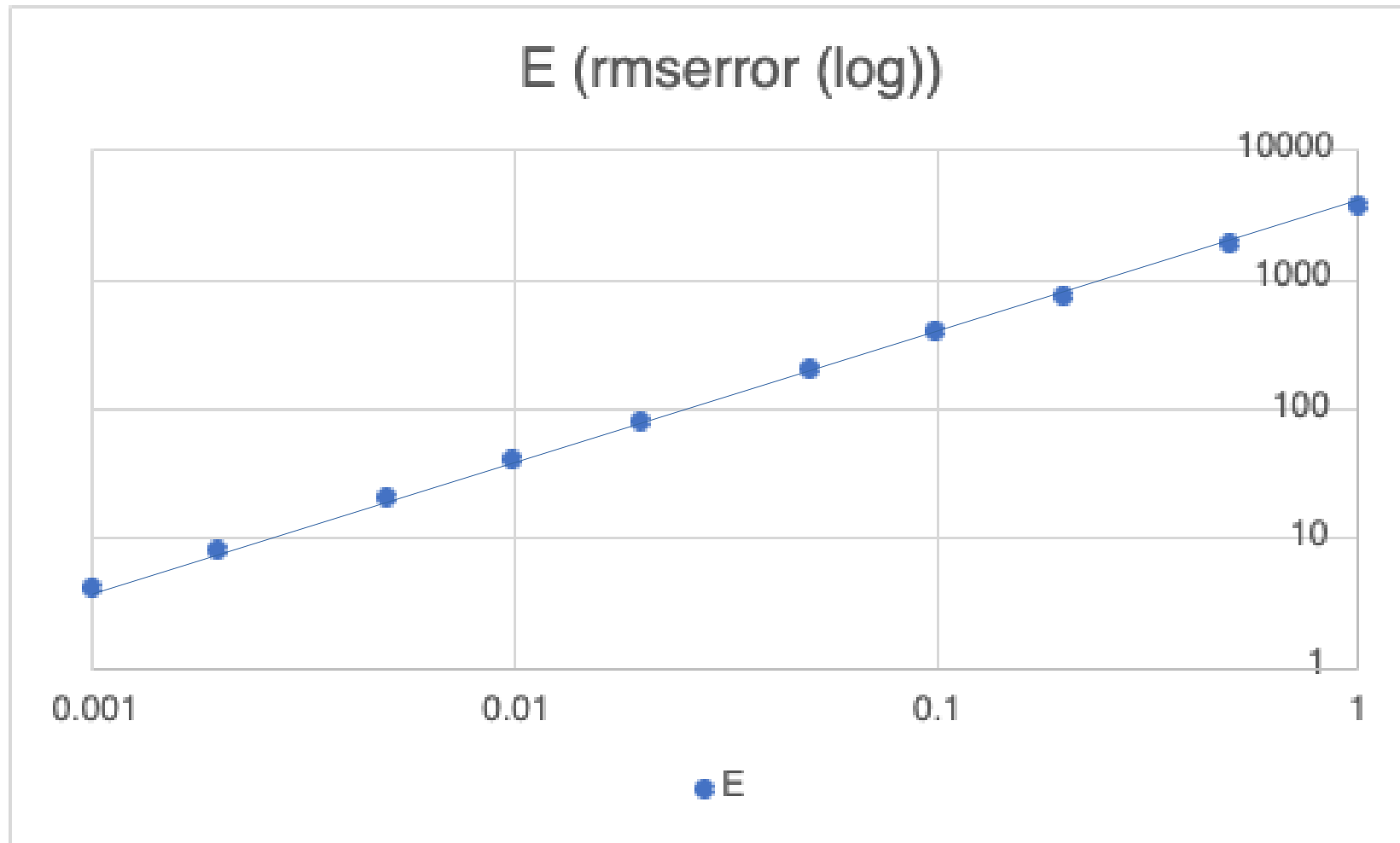
$dt = 0.01, \quad E = 40.1163702727105$

$dt = 0.005, \quad E = 20.092838473780535$

$dt = 0.002, \quad E = 8.045470342534554$

$dt = 0.001, \quad E = 4.024125928552825$

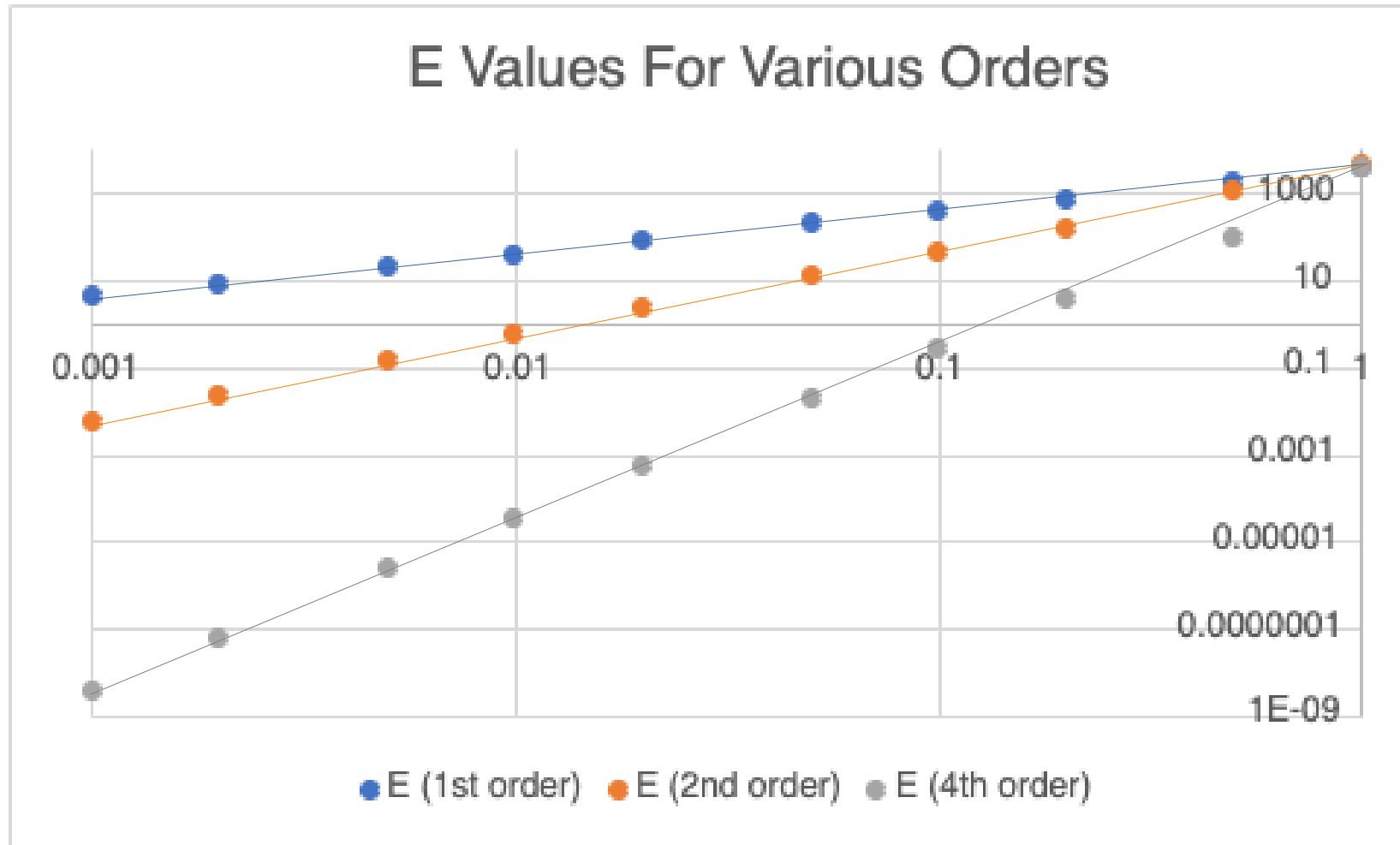
Plotting the values above on a log-log plot yields the following graph:



As evident by the graph above, a straight line with a slope of 1, cuts through all the points on the graph. This means that E is proportional to dt to the power 1, when dt is small.

Question 2)

After calculating the error E in both methods over the range of dt , we get the following graph:



The graph is a log-log plot with straight lines, with a slope of 1, running through the data, which demonstrates that E scales as dt^2 for the second-order method and dt^4 for the fourth-order method.