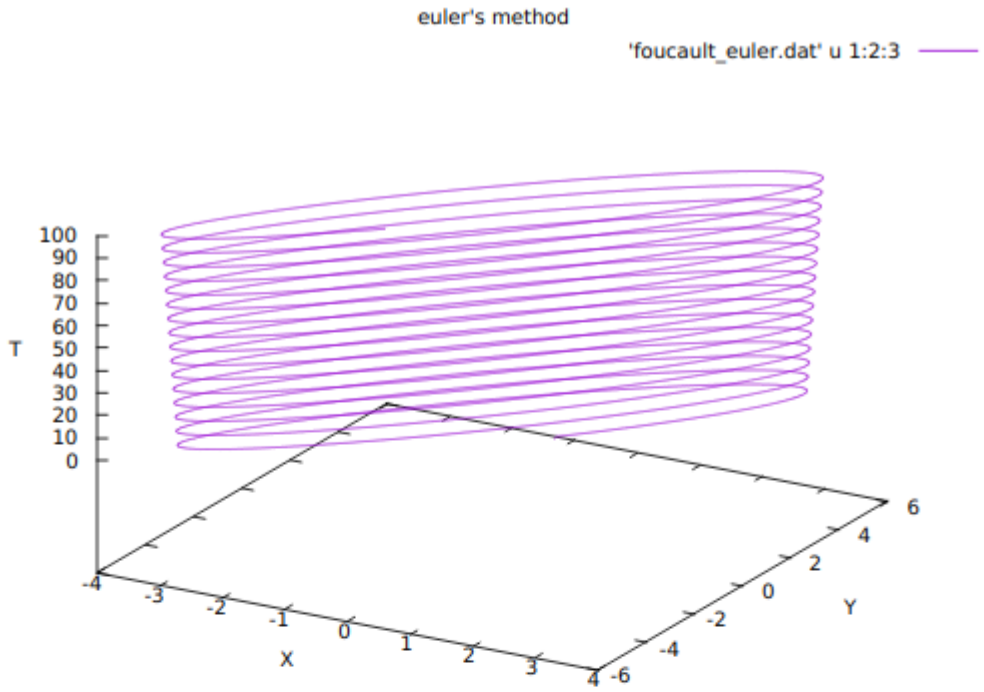
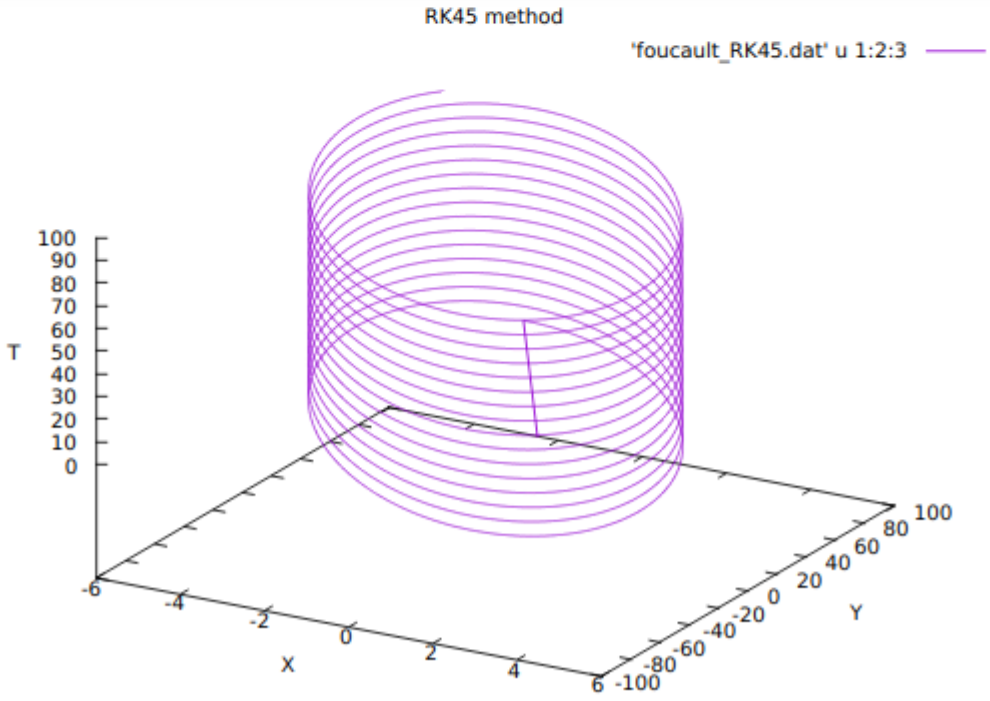
Comparison between Euler's Method and RK45 for different step sizes

For this purpose we will plot x&y vs T to see the clear difference as step size is increased

1) For a step size of 0.001

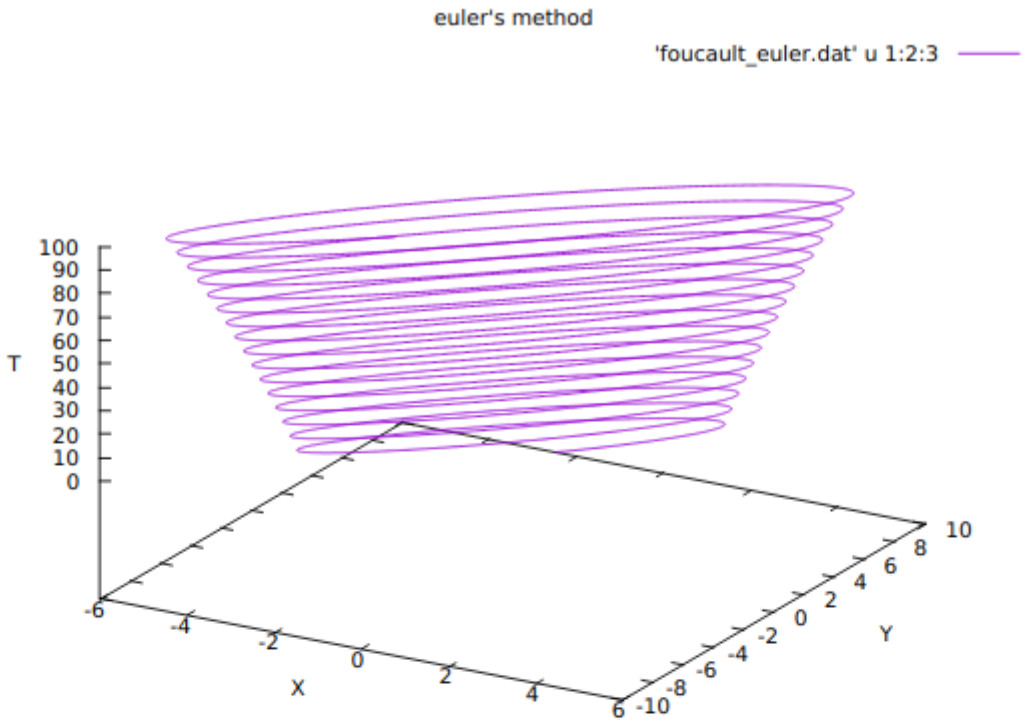


view: 60.0000, 30.0000 scale: 1.00000, 1.00000

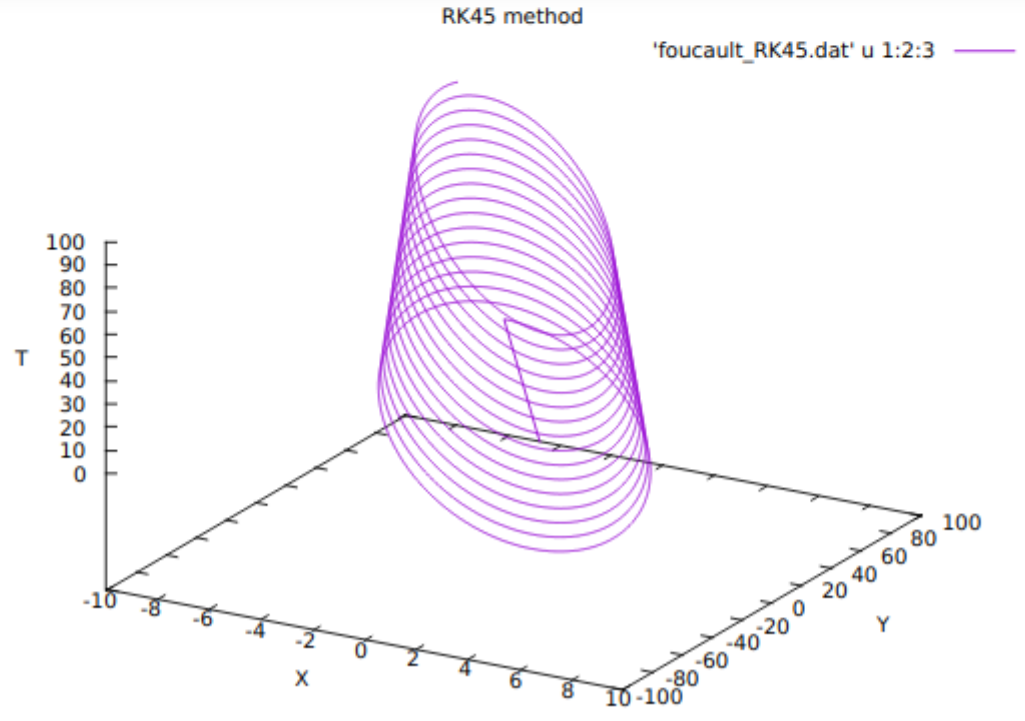


view: 60.0000, 30.0000 scale: 1.00000, 1.00000

2) Step size = 0.01

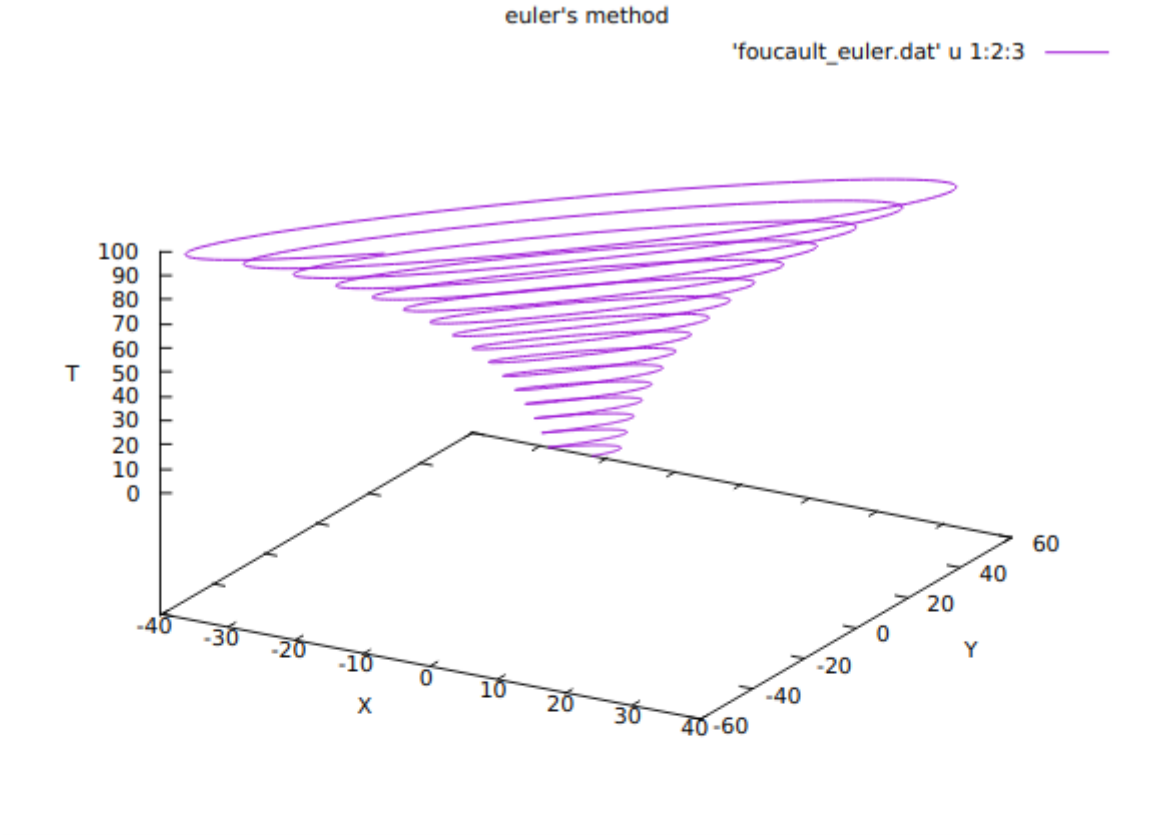


view: 60.0000, 30.0000 scale: 1.00000, 1.00000

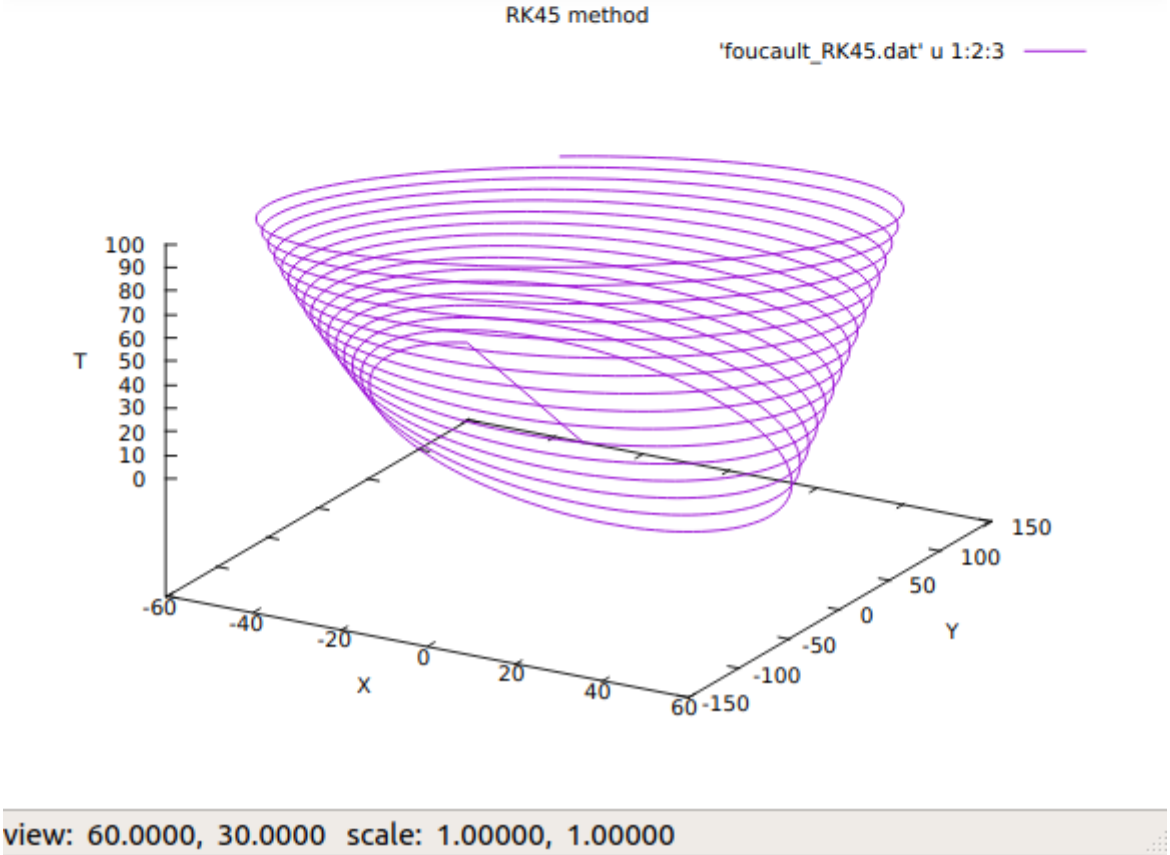


view: 60.0000, 30.0000 scale: 1.00000, 1.00000

3) Step size 0.05

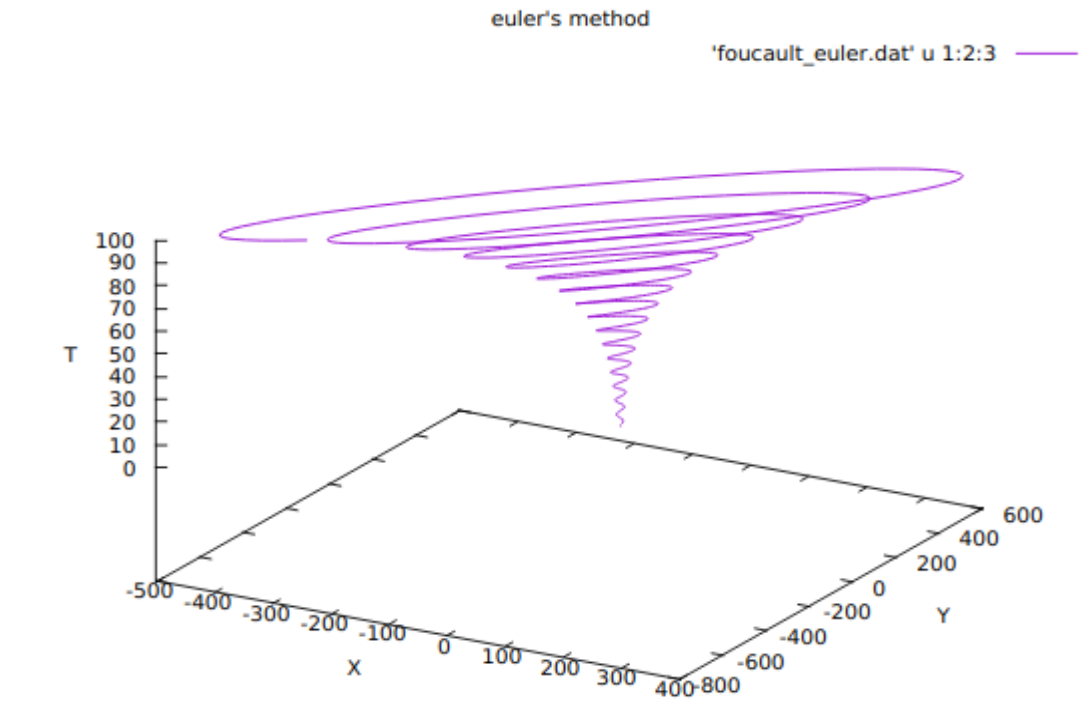


view: 60.0000, 30.0000 scale: 1.00000, 1.00000

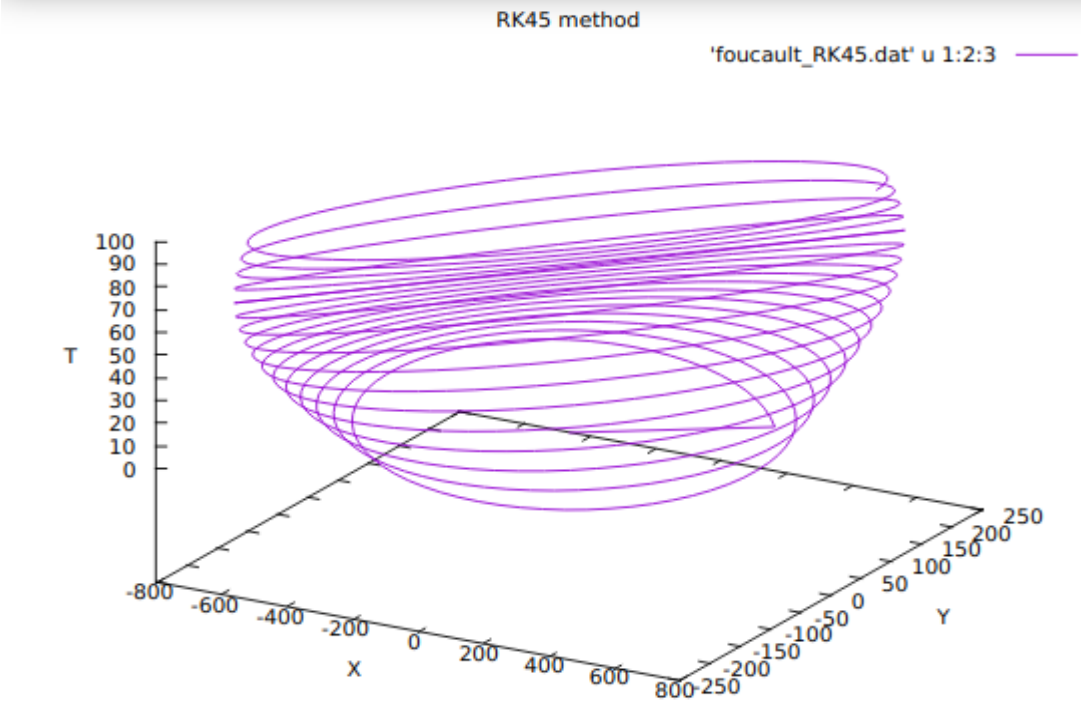


view: 60.0000, 30.0000 scale: 1.00000, 1.00000

4) Step Size 0.1



view: 60.0000, 30.0000 scale: 1.00000, 1.00000



view: 60.0000, 30.0000 scale: 1.00000, 1.00000

It can be clearly seen that as the step size increases that the graph given by Euler starts spiralling outwards whereas the once by RK45 method remains more or less at a constant value.

This indicates that the RK45 method is better since it gives more or less the expected type of output even for larger values of step-size.

It can be said so since the RK45 method works on values of differentials at intermediate values in the step and hence making it more accurate than the Euler method which uses only the inital point values of function and its derivative to generate the next value.