Computational Physics - PH3264

Module 2 - Integration

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1. **Euler's Method:**
   Step Size 0.001: 7.24764
   Step Size 00.01: 28.0671
2. **Modified Euler's Method:**
   Step Size 0.001: 0.07706
   Step Size 00.01: 4.76803
3. **Improved Euler's Method:**
   Step Size 0.001: 0.05128
   Step Size 00.01: 3.59668
4. **Runge-Kutta RK-4 Method:**
   Step Size 0.001: $3.54 \cdot 10^{-6}$
   Step Size 00.01: 0.02834
5. The value of x (starting with $x_0 = 0.1$ and $v_0 = 1.9$) at the end of 5000 iterations is -2.39932.
6. The value of x (starting with $x_0 = 0$ and $v_0 = 1.999$) at the end of 5000 iterations is -2.34132.
7. When $v_0 > 2$, the function $x(t)$ becomes monotonously increasing. The corresponding graphs for Qn.5, Qn.6 and Qn.7 are shown in Figure 1.

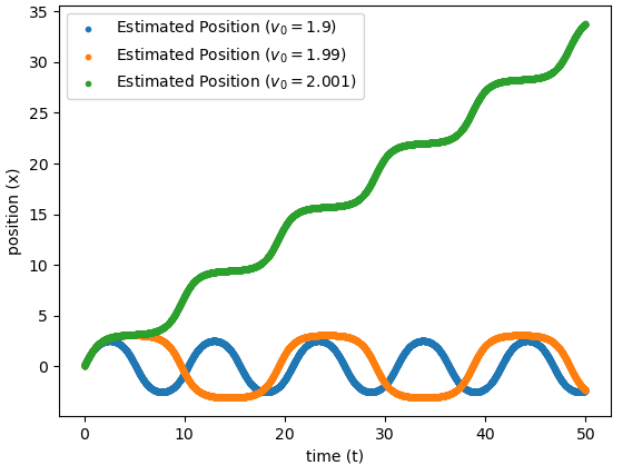

Figure 1: Solution for x with different initial values.

8. The final y value of particle 1 at $t = 40$ is -0.11891. As the system is symmetric about the first and 26^{th}. Therefore, we expect the graph for time evolution of particle 1 to be identical to that of particle 26. This has been shown in Figure 2.

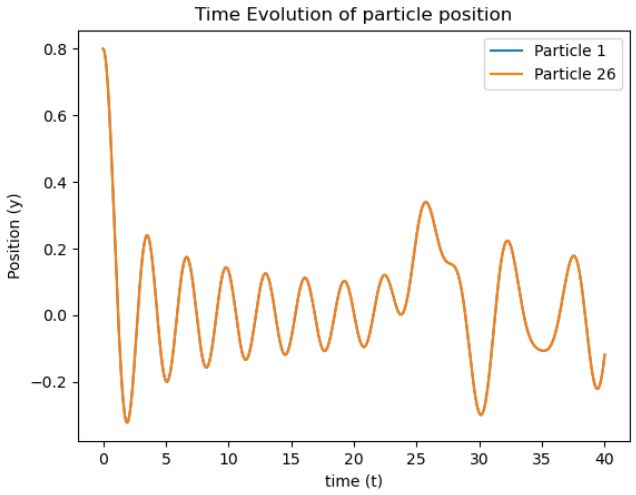

Figure 2: Solution for x with different initial values.

9. The value of the function at $x = 0.8$ is 0.28147.