

Consider the autonomous system

$$\begin{aligned}\frac{dx}{dt} &= y \\ \frac{dy}{dt} &= 2x^2 + 2y\end{aligned}$$

with initial condition $(x(1), y(1)) = (0, 2)$

Problem 1: (4 points) Use Euler's Method with step size $\Delta t = \frac{1}{2}$ to approximate $x(2)$ and $y(2)$.

Problem 2: (4 points) Are you assured there is a solution for the given initial value problem? Are you assured a solution exists at time $t = 2$? Are you assured that a solution, if it exists, is unique?

Problem 3: (2 points) Write something about the `ButterflyEffect` application that clearly demonstrates your usage of it.