Comp. Anal. of Phys. Sys.

HW7

(Upload a single PDF file as your homework.)

***Predator-Prey (Lotka-Volterra) Model**:*

1. Explain the predator-prey model governed by the Lotka-Volterra equations.

2. The differential equations for this model can be given as,

$$\frac{dx}{dt} = \alpha x + \beta xy$$

$$\frac{dy}{dt} = \gamma y + \delta xy$$

where
x(t): Predator population,
y(t): Prey population,

the constants:
α: Prey increase rate (if left alone),
β: Probability that the two species coming together,
γ: Predator decrease rate (if left alone),
δ: Rate of encounters of the two species ($\beta = -\delta$ generally).

Take $\alpha = 0.25$, $\beta = -\delta = -0.01$, $\gamma = -1$, $x_0 = 80$ and $y_0 = 30$ and solve these equations using either the fourth order Runge-Kutta scheme or special commands defined by a Python module.

Plot (t-x), (t-y), (x-y) graphs.