

## Matlab Code

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1 %% HW 03 – Nonlinear Systems Simulation
2 %% Document Information
3 % * Author: Bardia Mojra
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5 % * Title: HW 03 – Nonlinear Systems Simulation
6 % * Term: Fall 2021
7 % * Class: EE 5323 – Nonlinear Systems
8 % * Dr. Lewis
9
10 %% Voltera Predator–Prey System
11 % Consider the Voltera predator–prey system
12 %
13 % * $$ \dot{x}_1 = -x_1 + x_1 x_2 $$
14 % * $$ \dot{x}_2 = x_2 - x_1 x_2 $$
15 %
16 % # Find the equilibrium points and their nature.
17 %
18
19 clc
20 close all
21 warning('off','all')
22 warning
23
24 x0_set = -2:.5:2;
25 t_intv = [0 100];
26 x_0 = [4.5, 9.7]'; % initial conditions for x(t)
27 figure
28 [t,x] = ode23('Voltera', t_intv, x_0);
29 plot(t,x)
30 hold on;
31 grid on;
32 title('Voltera Predator–Prey System – Time Plot');
33 ylabel('x');
34 xlabel('t (sec)');
35 legend('Predator', 'Prey');
36 t_intv = [0 10];
37 figure
38 for i=x0_set
39 for j=x0_set
40 x0 = [i; j];
41 [t,x] = ode45('Voltera', t_intv, x0);
42 plot(x(:,1),x(:,2))
43 hold on;
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44 end
45 end
46 title('Voltera Predator-Prey System - Phase Plane');
47 ylabel('x_2 - Predator');
48 xlabel('x_1 - Prey');
49 axis([-5 5 -5 5]);
50 grid on;
51
52 %%
53 %
54 % function xdot = Voltera(t,x)
55 %     xdot = [-x(1)+x(1)*x(2); x(2)-x(1)*x(2)];
56 % end
57 %

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