Mathematical Modeling (Home Work # 2)

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**Solution**

Let

**Graphs**

Let

**Time Series Plot**

**Code:**

[t,y] = ode45(@na,[0 20],[1; 0]);

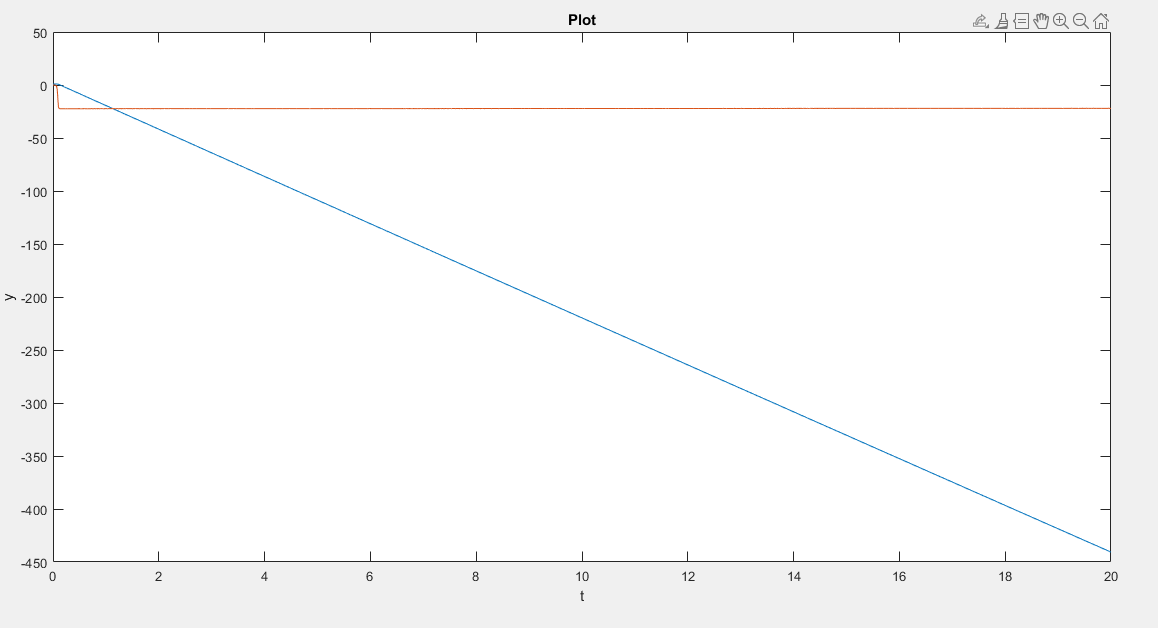
plot(t,y(:,1),t,y(:,2))

title('Plot');

xlabel('t');

ylabel('y');

**Initial conditions 1 and 0**

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**Phase Portrait Plots**

**Code:**

[X1,X2] = meshgrid(-10:0.5:10);

xs = arrayfun(@(x,y) {odeFun([],[x,y])}, X1, X2);

x1s = cellfun(@(x) x(1), xs);

x2s = cellfun(@(x) x(2), xs);

quiver(x1s, x2s)

xlabel('x\_1')

ylabel('x\_2')

axis tight equal;

function dxdt = odeFun(t,x)

w = 0.4;

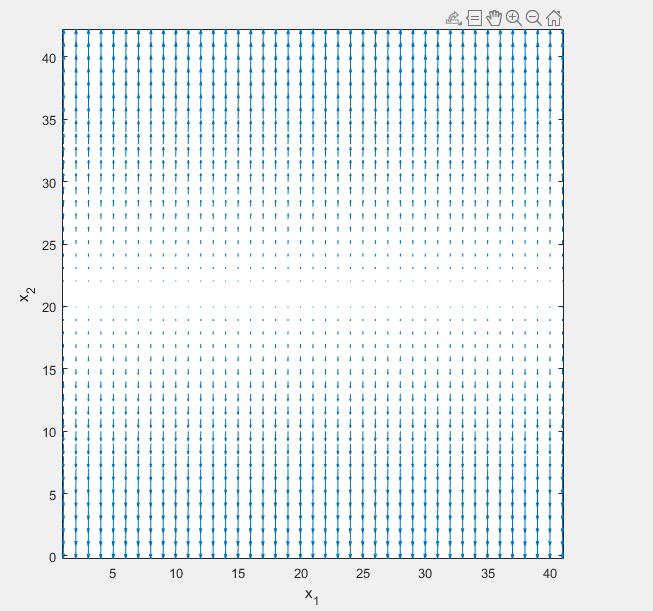
mu = 100;

alpha = 0.2

dxdt(1) = x(2);

dxdt(2) = mu\*x(2) - alpha\*x(2)^3 - w^2\*x(1);

end

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