Final Exam: LAB-Differential Equations

(Duration:75 minutes)

1. Find the the general solutions of the following differential equations

$$y''(x) + 2y(x) = x^2 e^x$$

Find the specific solution with the initial values: $y(0) = 0, y'(0) = 1$ and plot the graph of solution.

2. Consider differential equation

$$y'(x) - 3y(x) + e^x = 0$$

a) Find the general solution

b) Find the solution with the initial value $y(0) = 1$ and plot the graph of solution.

3. Consider differential equation

$$y''(x) + y^2(x) - x^3 = 0$$

with $y(0) = 0, y'(0) = 1/3$ Find the solution

4. Consider ODE

$$y'(x) = y(x) + x^2 e^x$$

plot 5 graphs of solutions with respect to constant C of the solution

5. Let the system of differential equation

$$\begin{cases} x'(t) = 4x(t) - y(t) + t \\ y'(t) = -x(t) - 3y(t) \end{cases}$$

Find the solutions of the system with the initial condition

$$x(0) = 1, y(0) = 1$$

and plot the graphs of solutions on the same coordinate