California State University Northridge

College of Engineering and Computer Science
Mechanical Engineering Department

Mechanical Engineering 501A
Seminar in Engineering Analysis

Fall 2017 Number: 15966 Instructor: Larry Caretto

October 4 Homework Problems

1. Solve the following initial value problem: $y' + 4y = 20$, with $y(0) = 2$. Show the details of your work.

2. Solve the following initial value problem: $y' = 1 + y^2$, with $y(0) = 0$. Show the details of your work.

3. Show that the initial value problem $xy' = 4y$, with $y(0) = 1$ has no solution. Does this contradict our present existence theorem?

4. Find all initial conditions such that the initial value problem $(x^2 – 2x)y' = 2(x – 1)y$, with $y(x_0) = y_0$ has (a) no solution, (b) more than one solution, and (c) precisely one solution.

5. Verify that the functions cos 3x and sin 3x form a basis of solutions for the differential equation $y'' + 9y = 0$ and solve the initial value problem with $y(0) = 4$ and $y'(0) = -6$.

6. Solve the following initial value problem: $9y'' + 6y' + y = 0$; $y(0) = 4$; $y'(0) = -13/3$. (Show each step.)

7. Solve the following boundary value problem: $y'' + 2y' + 2y = 0$; $y(0) = 1$; $y(\pi/2) = 0$. (Show each step.)

8. Find a second-order homogenous linear differential equation for which the functions e^{3x} and xe^{3x} are solutions. Find the Wronskian and use it to verify that these solutions are independent.