## Math 4010-101

Homework #8

Please remember when submitting any work via email or in person to...

## PUT YOUR NAME ON YOUR WORK!

Assumption: For Cauchy-Euler equations, we assume that the independent variable is positive (i.e., x > 0 or t > 0).

- #1. Solving the World's Problems: You might will want to use software to help with some parts.
  - (a) Solve y'' 4y' + 3y = t<sup>3</sup> + 3 using the method of undetermined coefficients, variation of parameters, and by converting to an equivalent linear system.
    Note: We already solved this equation using undetermined coefficients and variation of parameters in Homework #7. But enough people didn't get it right, so let's try again.
  - (b) Solve  $y''' 5y'' + 8y' 4y = e^t$  using the method of undetermined coefficients, variation of parameters, and by converting to an equivalent linear system.
  - (c) Solve  $t^2y'' + 2ty' 6y = e^{2t}$  then find the solution whose initial values are y(1) = 2 and y'(1) = 3.
  - (d) Solve y''' y'' + 9y' 9y = g(t) where g(t) is a continuous function.
- **#2.** Systemic Problems: Again, I encourage you to use software to aid in calculations.
  - (a) Find the general solution of the system:  $\begin{aligned} x_1' &= -x_1 \\ x_2' &= -x_1 \\ x_3' &= 3x_1 3x_2 \end{aligned}$ Then solve the corresponding initial value problem where  $x_1(0) = 0, x_2(0) = 1, x_3(0) = 1.$ (b) Find the general solution of the system:  $\begin{aligned} x_1' &= x_1 + x_2 + x_3 \\ x_2' &= -x_2 \\ x_3' &= -2x_1 - x_2 - 2x_3 + 2e^{-t} \end{aligned}$

Then solve the corresponding initial value problem where  $x_1(0) = 3, x_2(0) = 2, x_3(0) = 1$ .

Then solve the corresponding initial value problem where  $x_1(0) = 0, x_2(0) = 1, x_3(0) = 0$ .