



Problem Set 8

Differential Equations

Spring 2025

Second order differential equations are very similar to higher order differential equations. As of right now, we are manipulating the case of constant coefficients, which is the most simplified case overall. Before we get to the more complicated cases, *i.e.*, non-homogeneous cases, let us explore more to the canonicals behind them.

Clubs & Orgs Bulletin

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There is no bulletin this week.

Tip of the Week

Need a place to vent? A Place to Talk is JHU's peer listening group that offers a private, safe space for you to discuss anything you want, from daily frustrations to more serious issues. Peers are trained in listening skills and crisis intervention. APTT rooms are open Sunday-Friday from 7pm-1am in BLC 4010 and Wolman. Check them out on Instagram @jhuaptt to learn more.

1. (Repeated Roots and Wronskian). Let a differential equation of $y := y(x)$ be:

$$y''' + 3y'' + 3y' + y = 0.$$

Find the general solution the differential equation and give the Wronskian of your set of solutions.

2. (Higher order IVP with Dirichlet Condition). Consider the following initial value problem:

$$\begin{cases} 2y''' - 11y'' + 17y' - 6y = 0, \\ y(0) = 3, y(\log(4)) = 82, y(\log(9)) = 813. \end{cases}$$

Find the specific solution to the IVP.

3. (Complex Characteristics, Again). Find a full set of real solutions to the differential equation:

$$\frac{d^3 y}{dx^3} = -y.$$

4. (Reduction of Order). Let a ODE be defined as follows:

$$t^2 y'' + 2ty' = 2y, \quad t > 0.$$

Given a solution is $y_1(t) = t$, find the other solution by assuming $y_2(t) = u(t) \cdot y_1(t)$.