Math 24 Discussion Section

Warm Up

Given $ay'' + by' + cy = 0$, a second-order linear homogeneous equation with constant coefficients, let r_1 and r_2 be the roots of the corresponding characteristic equation. Write the general solution for

i. r_1 and r_2 both real but not equal.

ii. r_1 and r_2 complex conjugates.

iii. $r_1 = r_2$.

With your group, review the following terms and techniques including their associated formulas:

Repeated Roots	Reduction of Order	Undetermined Coefficients
Complementary Solution	Particular Solution	Variation of Parameters

Problems

1. Solve the following IVP: $y'' + 14y' + 49y = 0$, $y(-4) = -1$, $y'(-4) = 5$.

2. Find the general solution to $t^2 y'' + 2ty' - 2y = 0$ given that $y_1(t) = t$ is a solution.

3. (a) Given the nonhomogeneous equation $y'' + p(t)y' + q(t)y = g(t)$, find the particular solution $Y(t)$ (if possible) when

    $i.$ $g(t) = 3e^{2t}$ $ii.$ $g(t) = \sin(2t)$ $iii.$ $g(t) = 3e^{2t} + \sin(2t)$ $iv.$ $g(t) = \log(t)$ $v.$ $g(t) = 3e^{2t}\sin(2t)$

    (b) What about the case where $y'' - y = e^t$?

    (c) List (or construct a table of) the families of functions for which you can apply the method of undetermined coefficients.

4. Map out all the steps that would be required to find the solution to $y'' + 4y' + 3y = -e^{-t}(2 + 8t)$, $y(0) = 1$, $y'(0) = 2$.

5. Map out all the steps that would be required to find the general solution of $y'' + 6y' + 9y = t^{-3}e^{-3t}$, $t > 0$.

6. Solve the IVP from 4. Be aware of complications similar to those in 3(b).

7. Find the general solution to the ODE in 5.