Continuation of 3.1:

Reduction of Orders:

y_1 , y_2 are fundemental solutions of homogenous Eq

You are Geiven y_1

Then $y_2 = y_1 \int \frac{W}{(y_1)^2} dt$

3.5 Method of underdeterminant Coefficients

Non Homogenous Eq: $y'' + p(t)y' + q(t)y = g(t)$

Constants

Sol $\Rightarrow y_g = y_h + y_p$

if $g(t) = \cancel{C}$ polynomial : $y_p = P_n(t)$ ← polynomial

where if $g(t) = $ Constant $\longrightarrow y_p = (A)t^s$

$g(t) = t \rightarrow y_p = (At + B)t^s$

$g(t) = t^2 \rightarrow y_p = (At^2 + Bt + C)t^s$

⋮

if $g(t) = P_n(t)$ (Exponential) $\rightarrow y_p = P_n(t)\, e^{\alpha t}$

where $y_p = \left((A_1 + A_2 t + \cdots)\, e^{\alpha t} \right) t^s$

if $g(t) = P_n(t)\, e^{\alpha t} \sin\beta t$ or $P_n(t)\, e^{\alpha t} \cos\beta t$

Then:

$$y_p = \left[e^{\alpha t} \left[(A_1 + A_2 t \cdots) \sin\beta t + (B_1 + B_2 t + \cdots) \cos\beta t \right] \right] t^s$$

S: smallest, non negative Constant

بنضرب الحل بتا عشان مايكون y_p شبيه بأي حد موجود بـ y_h

3.6 : Variation of parameters

- Non Homogenous Eq : $y'' + p(t)\,y' + q(t)\,y = g(t)$

functions

* $g(t)$ is : a polynomial, Exponential and/or Cosine, Sine

→ y_1, y_2 are fundemental solutions

So :- $y = y_h + y_p$ $\quad y_p = v_1 y_1 + v_2 y_2$

$y_h = c_1 y_1 + c_2 y_2$

Where :- $v_1 = -\int \frac{y_2\, g(t)\, dt}{W(y_1, y_2)}$ ← There is no C in the integration

$v_2 = \int \frac{y_1\, g(t)\, dt}{W(y_1, y_2)}$

- Steps of solutions :-

* find y_1 and y_2

* find v_1 and v_2

* put in Equation