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Ch 3 ← on exam 1, 2, and final exam

3.1 – 4: Linear homogeneous DE

$\underbrace{ay'' + by' + cy = 0}$ homogen

linear combination of y'', y', y

General soln to 2nd order linear homog DE

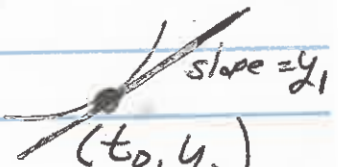
$$y = c_1\phi_1 + c_2\phi_2$$

where $y = \phi_1(t)$, $y = \phi_2(t)$ is a

(3.2) linearly indep set of solutions (fundamental set)

IVP $ay'' + by' + cy = g$,

$y(t_0) = y_0$, $y'(t_0) = y_1$



Discuss IVP in next class

a, b, c can be fns of t

If a, b, c are constants, plug in $y = e^{rt}$

$y = e^{rt} \Rightarrow y' = re^{rt} \Rightarrow y'' = r^2e^{rt}$

$ay'' + by' + cy = 0 \Rightarrow ar^2e^{rt} + bre^{rt} + ce^{rt} = 0$

characteristic poly: $ar^2 + br + c = 0$

3.1: Two real roots: $r = r_1, r_2$ $\quad y = c_1e^{r_1t} + c_2e^{r_2t}$

3.3: Two complex roots: $r = \lambda \pm i\mu$ $\quad y = c_1e^{\lambda t}\cos(\mu t) + c_2e^{\lambda t}\sin(\mu t)$

3.4 One repeated roots: $r = r_1, r_1$ $\quad y = c_1e^{r_1t} + c_2te^{r_1t}$

Examples

1) $4y'' + y' = 0 \Rightarrow 4r^2 + r = r(4r+1) = 0$

2) $4y'' + y = 0 \Rightarrow 4r^2 + 1 = 0$

3) $4y'' + 2y' + y = 0 \Rightarrow r = -\frac{1}{4} \pm \frac{i\sqrt{3}}{4}$

4) $4y'' + 4y' + y = 0 \Rightarrow 4r^2 + 4r + 1 = 0$
$(2r+1)^2 = 0$

Do your 3.1, 3.3, 3.4 HW NOW!!

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