

Section 31.7/8 : cont'd

Thursday, February 23, 2017 1:50 PM

Solve the following DE:

$$y'' - 10y' + 25y = 0$$

$$m^2 - 10m + 25 = 0$$

$$(m - 5)^2 = 0$$

$$m = 5, 5$$

one repeated real root

so proceed to step 3 on handout

$$y = (c_1 + c_2 x) e^{mx}$$
$$= (c_1 + c_2 x) e^{5x}$$

now check:

$$y = (c_1 + c_2 x) e^{5x}, \quad y'' - 10y' + 25y = 0$$

product rule

$$y' = (c_1 + c_2 x) 5e^{5x} + c_2 e^{5x}$$

$$y'' = (c_1 + c_2 x) 25e^{5x} + 5c_2 e^{5x} + 5c_2 e^{5x}$$

$$= 25(c_1 + c_2 x) e^{5x} + 10c_2 e^{5x}$$

so

$$y'' - 10y' + 25y = 0$$

$$\left[25(c_1 + c_2 x) e^{5x} + 10c_2 e^{5x} \right] - 10 \left[5(c_1 + c_2 x) e^{5x} + c_2 e^{5x} \right]$$

$$\begin{aligned} & \left[\cancel{25(c_1 + c_2 x) e^{5x}} + \cancel{10 c_2 e^{5x}} \right] - 10 \left[\cancel{5(c_1 + c_2 x) e^{5x}} + \cancel{c_2 e^{5x}} \right] \\ & + \cancel{25(c_1 + c_2 x) e^{5x}} = 0 \\ & 0 = 0 \quad \checkmark \end{aligned}$$

Solve:

$$y'' + 6y' + 9y = 0$$

$$m^2 + 6m + 9 = 0$$

$$(m + 3)^2 = 0$$

$$m = -3$$

$$y = (c_1 + c_2 x) e^{-3x}$$
