

Nach mustafa) Math 225 ①

euler $y = x^r$

$$3. \quad x^3 y'''' + 5x^2 y''' - 3xy'' = 0$$

$$x^3 (x^r)'''' + 5x^2 (x^r)''' - 3x (x^r)'' = 0$$

$$(x^r)'''' = r x^{r-4} (r-1)(r-2)(r-3)$$

$$(x^r)''' = r x^{r-3} (r-1)(r-2)$$

$$(x^r)'' = r x^{r-2} (r-1)$$

$$x^3 r x^{r-4} (r-1)(r-2)(r-3) + 5x^2 r x^{r-3} (r-1)(r-2) - 3x r x^{r-2} (r-1) = 0$$

$$x^3 r x^{r-4} (r-1)(r-2)(r-3) = 0$$

$$x^3 x^{r-4} \rightarrow x^{3+r-4}$$

$$= r x^{3+r-4} (r-1)(r-2)(r-3) = 0$$

$$= r x^{r-1} (r-1)(r-2)(r-3)$$

$$5x^2 r x^{r-3} (r-1)(r-2) = 5 r x^{r-1} (r-1)(r-2)$$

$$3x r x^{r-2} (r-1) = 3 r x^{r-1} (r-1)$$

$$= r x^{r-1} (r-1)(r-2)(r-3) + 5 r x^{r-1} (r-1)(r-2) - 3 r x^{r-1} (r-1)$$

$$= r x^{r-1} (r^2 - 3r + 2)(r-3) + r x^{r-1} (r^2 - 3r + 2) - 3 r x^{r-1} (r-1)$$

$$= r x^{r-1} (r^3 - 6r^2 + 11r - 6) + r x^{r-1} (r^2 - 3r + 2) - 3 r x^{r-1} (r-1)$$

← applying
exponent
rule

Neur mustafen) math 225) 2

$$\begin{aligned} 3r &= r^3 r \times r^{-1} - 6r^2 r \times r^{-1} + 11r r \times r^{-1} - 6r \times r^{-1} \\ &= r^4 \times r^{-1} - 6r^3 \times r^{-1} + 11r^2 \times r^{-1} - 6r \times r^{-1} \\ &= r^4 \times r^{-1} - 6r^3 \times r^{-1} + 11r^2 \times r^{-1} - 6r \times r^{-1} + 5r \times r^{-1} \\ &\quad (r^2 - 3r + 2) - 3r \times r^{-1} (r - 1) \end{aligned}$$

$$\begin{aligned} 5r \times r^{-1} (r^2 - 3r + 2) &\Rightarrow 5r^3 \times r^{-1} - 15r^2 \times r^{-1} + 10r \times r^{-1} \\ - 3r \times r^{-1} (r - 1) &\Rightarrow -3r^2 \times r^{-1} + 3r \times r^{-1} \end{aligned}$$

$$\begin{aligned} &= r^4 \times r^{-1} - 6r^3 \times r^{-1} + 11r^2 \times r^{-1} - 6r \times r^{-1} + 5r^3 \times r^{-1} \\ &\quad - 15r^2 \times r^{-1} + 10r \times r^{-1} - 3r^2 \times r^{-1} + 3r \times r^{-1} \end{aligned}$$

$$= r^4 \times r^{-1} - r^3 \times r^{-1} - 7r^2 \times r^{-1} + 7r \times r^{-1}$$

$$r^4 \times r^{-1} - r^3 \times r^{-1} - 7r^2 \times r^{-1} + 7r \times r^{-1} = 0$$

$$r^{r-1} (r^4 - r^3 - 7r^2 + 7r) = 0$$

$$r^{r-1} \neq 0$$

$$r^4 - r^3 - 7r^2 + 7r = 0$$

$$= r(r^3 - r^2 - 7r + 7) = 0$$

$$= 0$$

Abdur mustafa) math 225 (3)

$$3. = r(r^3 - r^2 - 7r + 7)$$

$$= r(r^2(r-1) - 7(r-1))$$

$$= r(r-1)(r^2-7)$$

$$= r(r-1)(r+\sqrt{7})(r-\sqrt{7})$$

$$r=0 \quad r=1 \quad r=-\sqrt{7} \quad r=\sqrt{7}$$

$$y = c_1 x^0 + c_2 x^1 + c_3 x^{-\sqrt{7}} + c_4 x^{\sqrt{7}}$$

$$y = c_1 + c_2 x + \frac{c_3}{x^{\sqrt{7}}} + c_4 x^{\sqrt{7}}$$