Quiz 8

MATH 2280, ORDINARY DIFFERENTIAL EQUATIONS, SPRING 2024

NAME: A#:

Problem 1. Exercise 17.8o (10 points) Find the general solution of the following ODE. Espress your answer in terms of real-valued function only.

$$y'' - 2\,y' - 15\,y = 0$$

Solution:

$y'' - 2y' - 15y = 0$

↳ $r^2 - 2r - 15 = 0$

$\Rightarrow r^2 - 2r + 1 - 16 = 0$

$\Rightarrow (r-1)^2 = 16$

$\Rightarrow (r-1) = \pm 4$

$\Rightarrow r = 1 \pm 4$

$\Rightarrow r_1 = 5,\ r_2 = -3$

$\Rightarrow y_1 = e^{5x},\ y_2 = e^{-3x}$

$\longrightarrow y = c_1 e^{5x} + c_2 e^{-3x}$

Problem 2. Exercise 19.1a (10 points) Find the general solution to the following differential equation.

$$y^{(4)} - 4\,y''' = 0$$

Solution:

$y^{(4)} - 4y''' = 0$

$\hookrightarrow \quad r^4 - 4r^3 = r^3(r-4) = 0$

$\Rightarrow \quad r_1 = 0,\ r_2 = 0,\ r_3 = 0,\ r = 4$

$\Rightarrow \quad y_1 = 1,\ y_2 = x,\ y_3 = x^2,\ y_4 = e^{4x}$

$\longrightarrow \quad y = c_1 + c_2 x + c_3 x^2 + c_4 e^{4x}$