Test Overview

31.1   Checking a Solution

31.2   Separable DE

31.4   Linear DE

31.6   Applications

31.7 ⎫ Auxiliary Equation: Distinct Real Roots

31.8 ⎭   Repeated / Complex Roots

31.9   Nonhomogeneous DE

Quiz 4

Quiz 5

Quiz 6

Quiz 7

Quiz Solutions
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We'll review 31.6 and 31.9

Ex: Express as a DE:

The rate of change of A with respect to t is proportional to A

$$\frac{dA}{dt} \propto A$$

Answer:
$$\frac{dA}{dt} = \boxed{k} A$$

Ex: Solve $y'' - 6y' + 8y = 2x - 3$

1) Find y_c

$$y'' - 6y' + 8y = 0$$

Section 31.7/31.8

$$m^2 - 6m + 8 = 0$$

$$(m-2)(m-4) = 0$$

$$m = 2, 4$$

Distinct Real Roots

$$y = C_1 e^{m_1 x} + C_2 e^{m_2 x}$$

$$y_c = C_1 e^{2x} + C_2 e^{4x}$$

2) Set up y_p

$$f(x) = 2x - 3$$

$$f' = 2 \qquad \text{no new like terms}$$

$$y_p = Ax + B$$

ASIDE (See 31.9)

$$f(x) = e^{4x} - 3x^2$$

$$y_p = Ae^{4x} + Bx^2 + Cx + D$$

3) $y_p \Rightarrow$ DE (Find A, B)

$$y_p = Ax + B$$
$$y_p' = A$$
$$y_p'' = 0$$

DE : $\quad y'' - 6y' + 8y = 2x - 3$

$$0 - 6(A) + 8(Ax + B) = 2x - 3$$

$$-6A + 8Ax + 8B = 2x - 3$$

$$\boxed{8A} \, x + \boxed{-6A + 8B} = 2x - 3$$

x: $\qquad 8A = 2$

$\qquad\qquad A = \dfrac{1}{4}$

Constants : $\qquad -6A + 8B = -3$

$$-\frac{6}{4} + 8B = -\frac{12}{4}$$

$$8B = -\frac{6}{4}$$

$$B = \frac{-6}{32} \quad \text{or} \quad \frac{-3}{16}$$

$$y_p = Ax + B$$
$$y_p = \frac{1}{4}x - \frac{3}{16}$$

4) $y = y_c + y_p$

$$y = \underbrace{C_1 e^{2x} + C_2 e^{4x}} + \underbrace{\tfrac{1}{4}x - \tfrac{3}{16}}$$

Part 3 : Statistics

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Statistics: Collection, analysis and
interpretation of data

1. Collection and Representation of Data

Population : set of all measurements
of interest

Sample : a subset of population

Ex: Population : salaries of all engineers
in Canada ($)

Sample : Salaries of 100
chosen engineers

Sample: Salaries of 100 chosen engineers

Samples should be <u>representative</u> of the population.

e.g. Survey engineers from different disciplines
" cities
with different experience
" gender
" nationalities