

2023-24 First Semester
MATH2023 Ordinary and Partial Differential Equations (1002)

Assignment 1

Due Date: **21/Sep/2023(Thu.), on or before 16:00, in tutorial class.**

- Write down your **CHN name** and **student ID**. Write neatly on **A4-sized** paper (*staple if necessary*) and **show your steps**.
 - For online students, hand in your homework in **one pdf file** on iSpace.
 - **Late submissions or answers without details will not be graded.**
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1. Determine the order of the given differential equations; also state the linearity and homogeneity.

- (a) $t^2 \frac{d^2 y}{dt^2} + t \frac{dy}{dt} + 2y = \tan t$
- (b) $(1 + xy^2) \frac{d^3 y}{dx^3} + x \frac{dy}{dx} + ye^x = 0$
- (c) $\left(\frac{dy}{d\omega} \right)^4 + \tan \omega \frac{dy}{d\omega} + \omega y = 0$
- (d) $\frac{d^2 y}{dt^2} + \sin(t + y) = \sin(t)$
- (e) $\frac{d^3 y}{dt^3} + t \frac{dy}{dt} + (\cos^2 t)y = t^3$

2. Verify that the given function or functions is a solution of the differential equation.

$$y'' + y = \sec t, 0 < t < \pi/2; \quad y = (\cos t) \ln \cos t + t \sin t.$$

3. Find the general solution of the given differential equation and determine the interval in which the solution is valid.

- (a) $y' + \frac{1}{t}y = 3 \cos 2t, \quad t > 0$
- (b) $t^3 y' + 4t^2 y = e^{-t}$

4. Find the solution of the following initial value problem and determine the interval in which the solution is valid.

- (a) $y' - y = 2te^{2t}, \quad y(0) = -1.$
- (b) $ty' + 2y = \sin t, \quad y(\pi/2) = 1.$
- (c) $y' = (1 - 2x)/y, \quad y(1) = -2.$
- (d) $y' = 3x^2/(3y^2 - 4), \quad y(1) = 0$