

AI-C 201 Differential Equations

Homework 1

(Deadline: 24th Sep, 2026)

1. Find the derivative of

$$\frac{\cos 3t}{\sqrt{1 - (3t)^2}} \quad (1)$$

2. Determine

$$I(t) = \int_0^t x^2 e^{-6x} dx \quad (2)$$

3. Examine the following equations carefully and determine the order of the equation and whether the equation is nonlinear, LTV, or LTI.

(a)

$$\frac{dy}{dt} + e^y y = 0 \quad (3)$$

(b)

$$\frac{dy}{dt} + e^t y = 0 \quad (4)$$

(c)

$$\frac{d^2 y}{dt^2} + 4y \frac{dy}{dt} + 2y = 0 \quad (5)$$

(d)

$$\left(\frac{dy}{dt}\right)^2 + 4\frac{dy}{dt} + 2y = 0 \quad (6)$$

(e)

$$\frac{d^3 y}{dt^3} + \frac{d^2 y}{dt^2} + 4\frac{dy}{dt} + 2y = e^{-t^2} \quad (7)$$