



Assignment 1

Problem 01: Give an interval I of definition of each solution. Use an online graphing utility to obtain the graph of an explicit solution.

- i. $x \frac{dy}{dx} + (1 + x \cot x)y = x, \quad y = -\cot x + \frac{1}{x} + \frac{C_1}{x} \csc x$
- ii. $(x^2 + 1) \frac{dy}{dx} + 2xy = 4x^2, \quad 3y = \frac{4x^3}{(x^2+1)} + \frac{3c}{(x^2+1)}$
- iii. $(2y^3 + x) \frac{dy}{dx} = y, \quad x = y^3 + cy$

Problem 02: Identify the differential equation and find the solution.

- i. $(xy + 2x + y + 2)dx + (x^2 + 2x)dy = 0$
- ii. $\frac{dy}{dx} + \frac{y}{x \ln x} = \frac{3x^2}{\ln x}$
- iii. $e^x[y - 3(e^x + 1)^2]dx + (e^x + 1)dy = 0, \quad y(0) = 4$
- iv. $\frac{dQ}{dt} = k(Q - 70)$
- v. $\sqrt{1 - y^2}dx - \sqrt{1 - x^2}dy = 0, y(0) = \frac{\sqrt{3}}{2}$
- vi. $\frac{dP}{dt} + 2tP = P + 4t - 2$
- vii. $\frac{dy}{dx} = \frac{1}{e^y - x}$
- viii. $\frac{dy}{dx} + y = f(x), y(0) = 1, \text{ where } f(x) = \begin{cases} 1 & 0 \leq x \leq 1 \\ -1 & x > 1 \end{cases}$
- ix. $x^2 \frac{dy}{dx} - 2xy = 3y^4, \quad y(1) = \frac{1}{2}$
- x. $3(1 + t^2) \frac{dy}{dt} = 2ty(y^3 - 1)$
- xi. $x \frac{dy}{dx} = y + \sqrt{x^2 - y^2}, \quad x > 0$
- xii. $ydx + x(\ln x - \ln y - 1)dy = 0, \quad y(1) = e$