Data

3.(a) linear 2 order

(b) nonlinear 3 order

(c) nonlinear 1. order

(d) nonlinear 2 order

4.(a) $y' = -\sin \ln \frac{1}{x}$

sol $y'' = -\cos \ln \frac{1}{x^2} + \sin \ln \frac{1}{x^2}$

and $x^2(-\cos\ln x \cdot \frac{1}{x^2} + \sin \ln x \cdot \frac{1}{x^2})$

$+ x(-\sin \ln x \cdot \frac{1}{x}) + \cos\ln x$

$= 0$

So verify y is the solution

$\therefore$ explicit.

(b) $-2x^2y + y^2 = 1$

sol $\begin{cases} -4xy\,dx + 2x^2\,dy + 2y\,dy = 0 \\ 2xy\,dx + (x^2 - y)\,dy = 0 \end{cases}$

$\therefore$ verify implicit

5.(a) $(1-x^2)\frac{dy}{dx} + x(y-3) = 0$

sol $\frac{dy}{3-y} = \frac{1+x-1}{1-x^2}\,dx$

$C - \ln(3-y) = -\ln(1-x) + \frac{1}{2}\ln\frac{1-x}{1+x}$

$\therefore C\cdot\sqrt{1-x^2} = 3-y$

$\therefore y = 3 - C\cdot\sqrt{1-x^2}$.

(b) $e^x y \frac{dy}{dx} = e^{-y} + e^{-2x-y}$ $y(0)=0$

$y \cdot e^y\,dy = \frac{1+e^{-2x}}{e^x}\,dx$

$\int y e^y\,dy = \int (e^{-x} + e^{-3x})\,dx$

$(y-1)e^y = -e^{-x} - \frac{e^{-3x}}{3} + C$

$\because y(0) = 0$

$\therefore (0-1)\,1 = -1 - \frac{1}{3} + C$

So $C = \frac{1}{3}$

$\therefore (y-1)e^y = -e^{-x} - \frac{1}{3}e^{-3x} + \frac{1}{3}$