Contoh 5

Tentukan apakah PD berikut linear atau tidak
Tentukan ordernya

1. $(1-x)y'' - 4xy' + 5y = \cos x$

$a_2(x) = 1-x$, $n=2$

$a_1(x) = -4$

$a_0(x) = 5$

$g(x) = \cos x$

Kesimpulan: DDE linear orde 2

2) $x\frac{d^3y}{dx^3} - 2\left(\frac{dy}{dx}\right)^4 + y = 0$

$a_3(x) = x$

$a_2(x) = 0$

$a_1(x) = 2(y')^3$ → fungsi thd y

$a_0(x) = 1$

$g(x) = 0$

∴ Non linear orde 3

Bentuk lain

$xy''' - 2(y')^4 + y = 0$

3) $yy' + 2y = 1 + x^2$

$a_1(x) = y$, fungsi thd y

$a_0(x) = 2$

$g(x) = 1 + x^2$

∴ linear orde 1

4) $x^2dy + (y - xy - xe^x)dx = 0$

$x^2\frac{dy}{dx} + (1-x)y = xe^x$

$a_1(x) = x^2$

$a_0(x) = 1-x$

$g(x) = xe^x$

∴ linear orde 1

5) $x^3y^{(4)} - x^2y'' + 4xy' - 3y = 0$

$a_2(x) = -x^2$

$a_1(x) = 4x$ ∴ Non linear n=2

$a_0(x) = -3(x^3y^3 \ldots)$

$g(x) = 0$

~~5~~ 6) $\frac{d^2y}{dx^2} + 9y = \sin y$

$y'' + 9y + \sin y = 0$

$a_2(x) = 1$

$a_0(x) = 9$

$g(x) = \sin y \rightarrow$ non linear

$\therefore$ nonlinear orde 2

7) $\frac{dy}{dx} = \sqrt{1 + \left(\frac{d^2y}{dx^2}\right)^2}$

$y' = \sqrt{1 + y''^{(2)}}$

$y'^{(2)} = 1 + y''^{(2)}$

$y''^{(2)} - y'^{(2)} = -1$

$\Leftarrow a_{n-2}(x) = y''$ nl

$a_1(x) = y'$ nl

$g(x) = -1$

$\therefore$ non linear, orde 2

8) $\frac{d^2r}{dt^2} = -\frac{k}{r^2}$

$r'' = -\frac{k}{r^2}$

$a_2(t) = 1$

$g(t) = -\frac{k}{r^2}$, non linear

$\therefore$ non linear, orde 2

9) $(\sin x)y''' - (\cos x)y' = 2$

$a_3(x) = \sin x \rightarrow$ bukan $f(y)$

$a_1(x) = -\cos x \rightarrow$ bukan $f(y)$

$g(x) = 2 \rightarrow$ bukan $f(y)$

$\therefore$ Linear orde 3

10) $(1-y^2)\,dx + x\,dy = 0$

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

$(1 - y^2 + xy') = 0$

$a_1(x) = x \Rightarrow \notin f(x)$

$a_0(x) = y \in f(y)$

$g(x) = 1 \notin f(y)$

$\therefore$ non linear orde 1