Subject موضوع الدرس Date التاريخ

section 1

① $y''' + 2xy'' + y = e^{2x}$

order أعلى مشتقة

degree أعلى أوس لأعلى مشتقة

$O = 3$, $D = 1$

② $y^{(5)} + 2x = y$

$O = 5$, $D = 1$

$\boxed{1}$ seperation D.E (not $y \mp x$) $\boxed{4}$ Exact D.E

$\boxed{2}$ Homo. D.E (same degree) $\boxed{5}$ Not exact D.E

$\boxed{3}$ non homo. D.E

① (Seperation)

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

$\int \frac{2x}{(x^2+1)}\,dx = \int \frac{2y}{(y^2+1)}\,dy \rightarrow \ln|x^2+1| = \ln(y^2+1) + \ln c$

$\cancel{\ln}(x^2+1) = \cancel{\ln}(y^2+1)\cdot c \rightarrow x^2+1 = y^2+1+c$

(Seperation)

② $yy' = xe^{y^2} \rightarrow y\frac{dy}{dx} = xe^{y^2} \xrightarrow{\times dx} y\,dy = xe^{y^2}\,dx$

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

③ (Seperation)

$y' = e^{-x-y} \rightarrow \frac{dy}{dx} = \frac{e^{-x}}{e^y} \xrightarrow{\times dx} dy = \frac{e^{-x}dx}{e^y} \rightarrow \int e^y\,dy = \int e^{-x}\,dx$

$e^y = -e^{-x} + C$

محمد و أميرة

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H.w

(seperation)

① $\csc y\,dx + \sec^2 x\,dy = 0$ ② $y' = \cos^2 x \cos y$

③ $y' = (y-1)(y-2)$ ④ $y' = xy^2 + y^2 + xy + y$

② Homo D.E

★ $(y^2 + x^2)\,dx - 2xy\,dy = 0$

let $y = xu \rightarrow \frac{dy}{dx} = u + (x)\frac{du}{dx}$

$(y^2+x^2)\,dx = 2xy\,dy \rightarrow \frac{dy}{dx} = \frac{y^2+x^2}{2xy} \rightarrow \frac{dy}{dx} = \frac{(x^2u^2)+x^2}{2x^2u} = \frac{x^2(u^2+1)}{2x^2u}$

$\frac{dy}{dx} = \frac{u^2+1}{2u} \rightarrow u + (x)\frac{du}{dx} = \frac{u^2+1}{2u} \rightarrow \frac{u^2+1}{2u} - u = \frac{u^2+1-2u^2}{2u}$

$\int \frac{2u}{1-u^2}\,du = \int \frac{1}{x}\,dx \rightarrow \ln(1-u^2)^{-1} = \ln(x) + \ln c$

$(1-u^2)^{-1} = xc \rightarrow \boxed{\left(1-\left(\frac{y}{x}\right)^2\right)^{-1} = xc}$

★ $xy' - y = xe^{\frac{y}{x}}$

$y = xu$

$x\frac{dy}{dx} = xe^{\frac{y}{x}} + y \longrightarrow \frac{dy}{dx} = \frac{xe^{\frac{y}{x}} + y}{x}$ $\frac{dy}{dx} = u + x\frac{du}{dx}$

$\frac{dy}{dx} = \frac{xe^u + xu}{x} = \frac{\cancel{x}(e^u+u)}{\cancel{x}} \rightarrow e^u + \cancel{u} = x\frac{du}{dx} + \cancel{u}$

$e^u = x\frac{du}{dx} \rightarrow \int e^{-u}\,du = \int \frac{1}{x}\,dx \rightarrow -e^{-u} = \ln x + c$

$-e^{-\frac{y}{x}} = \ln x + \ln c$

محمد و أميرة

CamScanner

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Assignment 1

$y = xu$

$\frac{dy}{dx} = u + x\frac{du}{dx}$

$\star\ y' = \frac{x^2+y^2}{xy}$

$\frac{dy}{dx} = \frac{x^2+x^2u^2}{x(xu)} = \frac{x^2(1+u^2)}{x^2(u)}$

$u + x\frac{du}{dx} = \frac{1+u^2}{u} \longrightarrow x\frac{du}{dx} = \frac{1+u^2}{u} - \frac{u}{1}$

$x\frac{du}{dx} = \frac{1+u^2-u^2}{u} \longrightarrow x\,du = \frac{1+\cancel{u^2}-\cancel{u^2}}{u}\,dx$

$\int u\,du = \int \frac{1}{x}\,dx \longrightarrow \frac{u^2}{2} = \ln x + c$

$\frac{u^2}{2} = \ln x + c$

Sheet

$(3x^2y+y^3)\,dx + (x^3+3xy^2)\,dy = 0$

$y' = \frac{x-y}{x+y}$

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

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