國立臺灣海洋大學河海工程學系 2019 工程數學(一) 2B 班第二次作業參考解答

系級：____________ 學號：____________ 姓名：____________

試求下述微分方程式:

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

   (2) $\frac{dy}{dx}=\frac{2x+y-1}{4x+2y-4}$

   (3) $y'=(x+y-2)^2$, $y(0)=2$ (hint: $u=x+y-2$)

試以正合法求下述微分方程式:

2. (1) $\frac{dy}{dx}=\frac{2x-e^x\sin y}{e^x\cos y+1}$

   (2) $(\cos x-2xy)+(e^y-x^2)y'=0$, $y(1)=4$

   (3) $2y^2+ye^{xy}+(4xy+xe^{xy}+2y)y'=0$

   (4) $3x^2+xy^\alpha-x^2y^{\alpha-1}y'=0$ 為正合 ODE，求α與 ODE 之解?

參考解答:

1. (1) $\frac{2}{\sqrt{7}}\tan^{-1}(\frac{1}{\sqrt{7}}\frac{3x+2y}{x-2})=\ln|x-2|+C$

   (2) $\frac{2}{5}(2x+y-\frac{1}{5}\ln|10x+5y-9|)=x+C$

   (3) $y=\tan x-x+2$

2. (1) $e^x\sin y+y-x^2=c$

   (2) $e^y-x^2y+\sin x=e^4-4+\sin 1$

   (3) $\phi(x,y)=2xy^2+e^{xy}+y^2=c$

   (4) $\alpha=-2$, $\phi(x,y)=x^3+\frac{x^2}{2y^2}=c$