2.3 Page 37

① $3(3x^2+y^2)\,dx-2xy\,dy=0$

not separable

$3(3\cdot t^2x^2+t^2y^2)\,dx-2\cdot t\cdot x\cdot t\,y\,dy=0$

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

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

∴ It is Homogenous

Put $\boxed{y=ux}$ (better) → [illegible] dy [illegible]

$x=vy$

$dy=u\,dx+du\cdot x$

$3(3x^2+u^2x^2)\,dx-2x\cdot ux(u\,dx+x\,du)=0$

$9x^2\,dx+3u^2x^2\,dx-2x^2u^2\,dx-2x^3u\,du=$

$9x^2\,dx+u^2x^2\,dx=2x^3u\,du$

$(9+u^2)x^2\,dx=2x^3u\,du$

$\frac{1}{x}\,dx=\frac{2u}{9+u^2}\,du$ (Separable

$\int\frac{1}{x}\,dx=\int\frac{2u}{9+u^2}\,du$

$c+\ln|x|=\ln(9+u^2)$

$c+\ln|x|=\ln\left(9+\frac{y^2}{x^2}\right)$

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⑩ not separable

$-y\,dx+(x+\sqrt{xy})\,dy=0$

$-ty\,dx+(tx+\sqrt{tx\cdot ty})\,dy=0$

$-ty\,dx+(tx+t\sqrt{xy})\,dy=0$

$-y\,dx+(x+\sqrt{xy})\,dy=0$

It is Homog

$\boxed{x=vy}$ → (better) [illegible] dx [illegible]

or $y=ux$

$dx=v\,dy+dv\cdot y$

$-y(v\,dy+dv\cdot y)+(vy+\sqrt{vy\cdot y})\,dy=$

$-y\cancel{v\,dy}-y^2\,dv+\cancel{vy\,dy}+y\sqrt{v}\,dy=0$

$y\sqrt{v}\,dy=y^2\,dv$

$\frac{1}{y}\,dy=\frac{1}{\sqrt{v}}\,dv$ (Separably

$\int\frac{1}{y}\,dy=\int v^{-\frac{1}{2}}\,dv$

$c+\ln|y|=2v^{\frac{1}{2}}$

$c+\ln|y|=2\sqrt{\frac{x}{y}}$

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25) Put $\boxed{u=y-2x+3}$ / $\frac{dy}{dx}=2+\sqrt{y-}$

$\frac{du}{dx}=\frac{dy}{dx}-2$

Go to D.E :

$\frac{du}{dx}+\cancel{2}=\cancel{2}+\sqrt{u}$

$du=\sqrt{u}\,dx$

$\frac{1}{\sqrt{u}}\,du=dx$ Separable

$\int u^{-\frac{1}{2}}\,du=\int dx$

$2u^{\frac{1}{2}}=x+c$

$2\sqrt{y-2x+3}=x+c$ (G.S)

㉗ Put $\boxed{u=x+y}$

$\frac{dy}{dx}=\frac{1-x-}{x+y}$

$=\frac{1-(x+y}{x+y}$

$\frac{du}{dx}=1+\frac{dy}{dx}$

Go to D.E :

$\frac{du}{dx}-\cancel{1}=\frac{1-u}{u}=\frac{1}{u}-\cancel{1}$

$u\,du=dx$ (Separable)

$\int u\,du=\int dx$

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

$\frac{(x+y)^2}{2}=x+c$

㉘ $(x+2y-4)\,dx-(2x+y-5)\,dy$

$(x+2y-4)\,dx=(2x+y-5)\,dy$

$\frac{x+2y-4}{2x+y-5}=\frac{dy}{dx}$

$(\text{line }1)\,dx+(\text{line }2)\,dy=0$

$(a_1x+b_1y+c_1)\,dx+(a_2x+b_2y+c_2)\,dy=0$

$\frac{1}{-2}\neq\frac{2}{-1}\Rightarrow$ two lines intersect

$x+2y-4=0$

$-2x-y+5=0$

[illegible] $\begin{cases}2x+4y-8=0\\-2x-y+5=0\end{cases}$

$3y-3=0$

$y=1\rightarrow\boxed{k=1}$

$x=-2+4=2\rightarrow\boxed{h=2}$

Put $x=u+h$

$\boxed{x=u+2}\longrightarrow dx=du$

& $y=v+k$

$\boxed{y=v+1}\longrightarrow dy=dv$

Go to (D.E) :

$[u+2+2(v+1)-4]\,du-(2(u+2)+v+1-$

$[u+\cancel{2}+2v+\cancel{2}-4]\,du-(2u+\cancel{4}+v-\cancel{4}$

$[u+2v]\,du-(2u+v)\,dv=0$ ∴

Homog [illegible]

$u=tv$

d