(2)

$$2x + 3x^2y + (x^3 - 3y^2)y' = 0$$

check exactness:

$$\left.\begin{array}{l}\frac{\partial}{\partial y}(2x + 3x^2y) = 3x^2 \\ \frac{\partial}{\partial x}(x^3 - 3y^2) = 3x^2\end{array}\right] =$$

$\Rightarrow$ exact.

$\Rightarrow \exists\ \phi \in C^2(\mathbb{R}^2)$ s.t. $\frac{\partial \phi}{\partial x} = 2x + 3x^2y$ (i)

and $\frac{\partial \phi}{\partial y} = x^3 - 3y^2$ (ii)

(i) $\Leftrightarrow$ $\phi = \int (2x + 3x^2y)\,dx + h(y)$ , some $h \in C^1$

$= x^2 + x^3y + h(y)$

$\overset{(ii)}{\Rightarrow}$ $\cancel{x^3} - 3y^2 = \frac{\partial \phi}{\partial y} = \cancel{x^3} + h'(y)$

$\Rightarrow$ $h'(y) = -3y^2$

$\Rightarrow$ $h(y) = -y^3 + \tilde{C}$, $\tilde{C} \in \mathbb{R}$.

Thus,

$$\phi = x^2 + x^3y - y^3 + \tilde{C}$$

and therefore:

general sol. of (2):

$$\underline{\underline{x^2 + x^3y - y^3 = C \ , \ C \in \mathbb{R}.}}$$