Ordinary Differential Equations – 1 (*ODE-1*)

Exercise 2

Question 1 Solve the following DEs

a. $xy' - y = (x+y)(\ln(x+y) - \ln(x))$

b. $y' = \dfrac{2y^3 - x^2 y}{2x^2 y - x^3}$

Question 2

a. Consider the DE $x^{\alpha} y \cdot y' + y^{\alpha} = x^{\beta}$, where $\beta = \dfrac{\alpha(\alpha-1)}{\alpha-2}$, $\alpha, \beta \in \mathbb{R}, \alpha \neq 2$. Prove that for some $m \in \mathbb{R}$, the substitution $y = z^m$ turns it into homogeneous.

b. Solve the obtained DE for $\beta = \dfrac{\alpha(\alpha-1)}{\alpha-2}, \alpha \notin \{0,1,2\}, y = z^m$. The solution contains indefinite integral.

Question 3 Solve the following DEs

a. $\dfrac{dy}{dx} = \dfrac{6x+y}{6x-y}$

b. $\dfrac{dy}{dx} = \dfrac{6x+y+4}{6x-y+8}$

Question 4 Solve the following DEs

a. $(2xy^4 + \sin(y)) + (4x^2 y^3 + x\cos(y))y' = 0$

b. $y' = \dfrac{1+y^2+3x^2 y}{1-2xy-x^3}$

Question 5 Solve the following DE

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