

2. עליך לפתור את המשוואה הדיפר' הבאה $\frac{dy}{dx} = \frac{3x^2 - 2y - y^3}{2x + 3xy^2}$ כאשר $y(1) = 2$ 50 נק'.

$$\frac{dy}{dx} = \frac{3x^2 - 2y - y^3}{2x + 3xy^2} \Rightarrow (3x^2 - 2y - y^3)dx - (2x + 3xy^2)dy = 0$$

$$\begin{cases} P_{(x,y)} = 3x^2 - 2y - y^3 & \rightarrow \frac{\partial P}{\partial y} = -2 - 3y^2 \\ Q_{(x,y)} = -(2x + 3xy^2)dy & \rightarrow \frac{\partial Q}{\partial x} = -2 - 3y^2 \end{cases} \Rightarrow \frac{\partial P}{\partial y} = \frac{\partial Q}{\partial x} \Rightarrow \text{exact}$$

$P(x,y)dx + Q(x,y)dy = 0$ על ידי אינטגרציה

$\frac{\partial P}{\partial y} = \frac{\partial Q}{\partial x}$ אינטגרציה

פתרון: $\int_{x_0}^x P(x,y)dx + \int_{y_0}^y Q(x_0,y)dy = 0$

$$\int_{x_0}^x (3x^2 - 2y - y^3)dx - \int_{y_0}^y (2x_0 + 3x_0y^2)dy = 0$$

$$[x^3 - 2yx - y^3x]_{x_0}^x - [2x_0y + x_0y^3]_{y_0}^y = 0$$

$$x^3 - 2yx - y^3x - x_0^3 + 2yx_0 + y^3x_0 - 2x_0y - x_0y^3 + 2x_0y_0 + x_0y_0^3 = 0$$

$$x^3 - 2yx - y^3x - x_0^3 + 2yx_0 + y^3x_0 - 2x_0y - x_0y^3 + 2x_0y_0 + x_0y_0^3 = 0$$

$$x^3 - 2yx - y^3x + C = 0, \quad C = 2x_0y_0 + x_0y_0^3 - x_0^3$$

$$y_{(1)} = 2 \Rightarrow 1^3 - 2 \cdot 2 \cdot 1 - 2^3 \cdot 1 + C = 0 \Rightarrow C = 11$$

$$x^3 - 2xy - xy^3 + 11 = 0$$