9.7.7

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Question

Find the solution of the pair of equations: $\frac{3}{x}+\frac{8}{y}=-1, \quad \frac{1}{x}-\frac{2}{y}=2, \quad x,y\neq 0.$

Solution:

let

$$\frac{1}{x}=u \tag{1}$$

$$\frac{1}{y}=v \tag{2}$$

$$\implies 3u+8v=-1 \tag{3}$$

$$u-2v=2 \tag{4}$$

Equations (3) and (4) cann be written as

$$\begin{pmatrix}3 & 8\\ 1 & -2\end{pmatrix}\begin{pmatrix}u\\ v\end{pmatrix}=\begin{pmatrix}-1\\ 2\end{pmatrix} \tag{5}$$

Forming the augmented matrix

$$\implies \left(\begin{array}{cc|c}3 & 8 & -1\\ 1 & -2 & 2\end{array}\right) \xleftrightarrow{R_2\to R_2-\frac{1}{3}\times R_1} \left(\begin{array}{cc|c}3 & 8 & -1\\ 0 & -\frac{14}{3} & \frac{7}{3}\end{array}\right) \tag{6}$$

on back substitution we get

$$\begin{pmatrix}u\\ v\end{pmatrix}=\begin{pmatrix}1\\ -\frac{1}{2}\end{pmatrix} \tag{7}$$

From (1) and (2) we get

$$\begin{pmatrix}x\\ y\end{pmatrix}=\begin{pmatrix}1\\ -2\end{pmatrix} \tag{8}$$

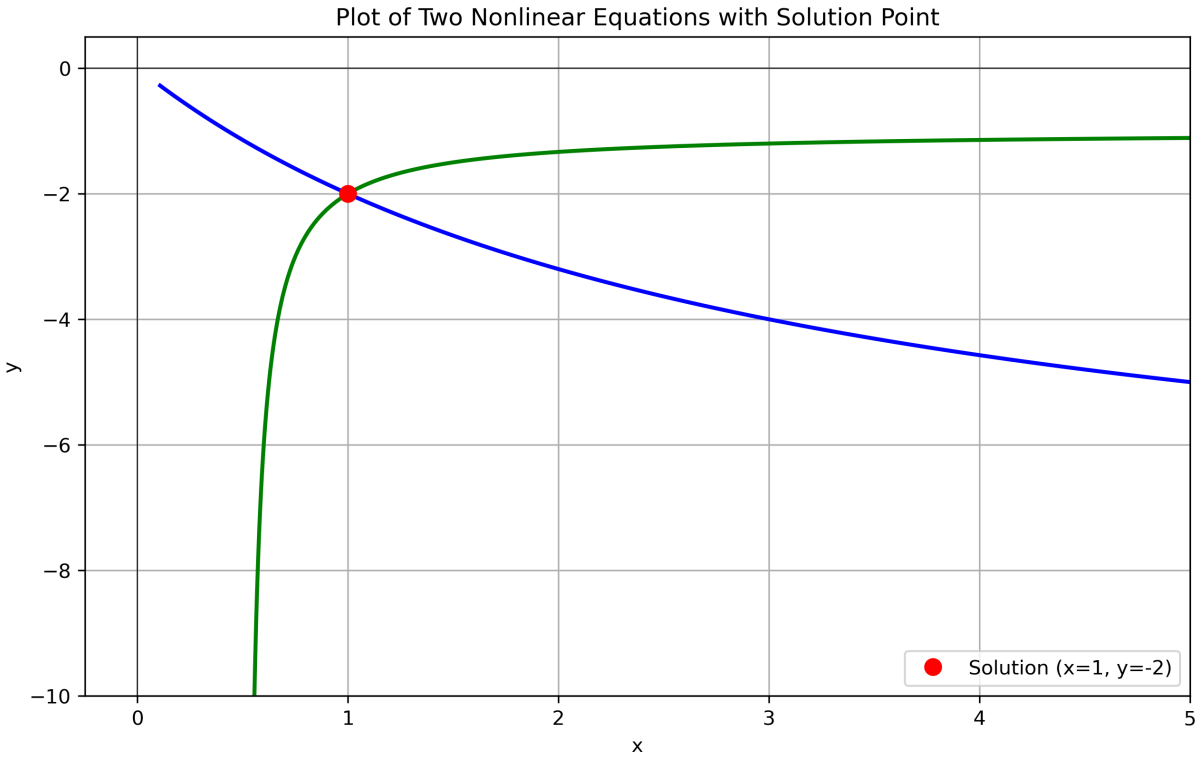

Fig. 0