

I.C.S.E 10, 2018

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Question: : 3(a) : If $(x+2)$ and $(x+3)$ are factors of $x^3 + ax + b$, find the values of ' a ' and ' b '. For given system of equations,

Solution: According to the question :

$x+2$ and $x+3$ are factors of $x^3 + ax + b$.
Then, -2 and -3 are solutions of the equation

$$x^3 + ax + b = 0 \quad (1)$$

On substituting $x = -2$ into the equation (1)

$$\Rightarrow (-2)^3 + a(-2) + b = 0$$

$$\Rightarrow 2a - b = -8 \quad (2)$$

On substituting $x = -3$ in the equation (1)

$$\Rightarrow (-3)^3 + a(-3) + b = 0$$

$$\Rightarrow 3a - b = -27 \quad (3)$$

The system of equations ,

$$2a - b = -8$$

$$3a - b = -27$$

can be re-written in matrix form as :

$$\begin{pmatrix} 2 & -1 \\ 3 & -1 \end{pmatrix} \begin{pmatrix} a \\ b \end{pmatrix} = \begin{pmatrix} -8 \\ -27 \end{pmatrix}$$

Let, i th row is a matrix be represented as R_i .

The system of equations ,

$$a_1x + b_1y = c_1$$

$$a_2x + b_2y = c_2$$

if represented as : $\begin{pmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \end{pmatrix}$

Solution of such system of equations is x_1 & y_1
where matrix is reduced using row transformation to ;

$$\begin{pmatrix} 1 & 0 & x_1 \\ 0 & 1 & y_1 \end{pmatrix}$$

$$\begin{pmatrix} 2 & -1 & -8 \\ 3 & -1 & -27 \end{pmatrix}$$

Transformation 1 : $R_1 \rightarrow R_2 - R_1$

$$\Rightarrow \begin{pmatrix} 1 & 0 & -19 \\ 3 & -1 & -27 \end{pmatrix}$$

Transformation 2 : $R_2 \rightarrow 3R_1 - R_2$

$$\Rightarrow \begin{pmatrix} 1 & 0 & -19 \\ 0 & 1 & -30 \end{pmatrix}$$

\therefore The value of $a = -19$ and value of $b = -30$.

Using values of a and b , equation (1) can be re-written as :

$$x^3 - 19x - 30 = 0 \quad (4)$$

This can be verified by plotting the graph of the equation

$$y = x^3 - 19x - 30 \quad (5)$$

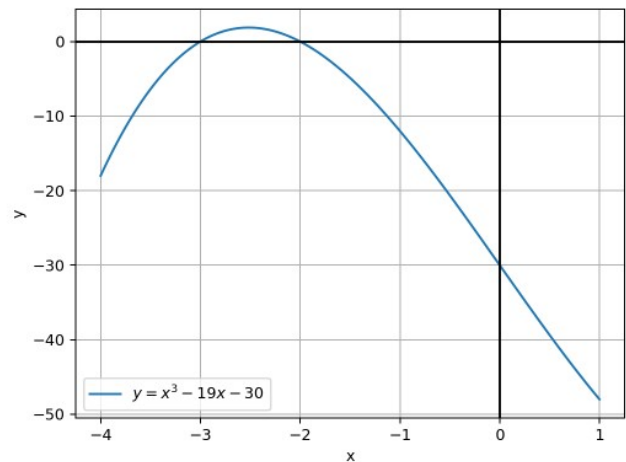


Fig. 1. Plot of $y = x^3 - 19x - 30$ intersects X-axis at $x = -3$ & $x = -2$.

a & b are solutions of equations (2) & (3).
Hence, a & b satisfies the above equations.

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===== RESTART: C:\Users\DELL\Desktop\outpu.py =====  
Enter the value of 'a' : -19  
Enter the value of 'b' : -30  
Given values of 'a' and 'b' are solutions of equations 2a-b=-8 & 3a-b=-27
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Fig. 2. Output of python code.