



## Pair of Linear Equations in Two variables Ex 3.4 Q19

**Answer :**

GIVEN:

$$bx + cy = a + b$$

$$ax \left( \frac{1}{(a-b)} - \frac{1}{(a+b)} \right) + cy \left( \frac{1}{(b-a)} - \frac{1}{(b+a)} \right) = \frac{2a}{(a+b)}$$

To find: The solution of the systems of equation by the method of cross-multiplication:

Here we have the pair of simultaneous equation

$$bx + cy - (a + b) = 0$$

$$ax \left( \frac{1}{(a-b)} - \frac{1}{(a+b)} \right) + cy \left( \frac{1}{(b-a)} - \frac{1}{(b+a)} \right) - \frac{2a}{(a+b)} = 0$$

By cross multiplication method we get

$$\frac{x}{\left( -\frac{2ac}{(a+b)} \right) - \left( -(a+b) \times \left( \frac{c}{(b-a)} - \frac{c}{(b+a)} \right) \right)} = \frac{-y}{\left( -\frac{2ab}{(a+b)} \right) - \left( -(a+b) \times \left( \frac{a}{(a-b)} - \frac{a}{(a+b)} \right) \right)}$$

$$= \frac{1}{\left( \frac{bc}{(b-a)} - \frac{bc}{(b+a)} \right) - \left( \frac{ac}{(a-b)} - \frac{ac}{(a+b)} \right)}$$

$$\frac{x}{\left( -\frac{2ac}{(a+b)} \right) - \left( \frac{-(a+b)c}{(b-a)} + c \right)} = \frac{-y}{\left( -\frac{2ab}{(a+b)} \right) - \left( \frac{-(a+b)a}{(a-b)} + a \right)}$$

$$= \frac{1}{\left( \frac{bc(b+a) - bc(b-a)}{(b-a)(b+a)} \right) - \left( \frac{ac(a+b) - ac(a-b)}{(a-b)(a+b)} \right)}$$

$$\frac{x}{\left( -\frac{2ac}{(a+b)} \right) - \left( \frac{-(a+b)c + c(b-a)}{(b-a)} \right)} = \frac{-y}{\left( -\frac{2ab}{(a+b)} \right) - \left( \frac{-(a+b)a + a(a-b)}{(a-b)} \right)}$$

$$= \frac{1}{\left( \frac{bc(b+a) - bc(b-a)}{(b-a)(b+a)} \right) - \left( \frac{ac(a+b) - ac(a-b)}{(a-b)(a+b)} \right)}$$

$$\frac{x}{\left( -\frac{2ac}{(a+b)} \right) - \left( \frac{-ac - bc + cb - ac}{(b-a)} \right)} = \frac{-y}{\left( -\frac{2ab}{(a+b)} \right) - \left( \frac{-a^2 - ab + a^2 - ab}{(a-b)} \right)}$$

$$= \frac{1}{\left( \frac{2abc}{(b-a)(b+a)} \right) - \left( \frac{2abc}{(a-b)(a+b)} \right)}$$

$$\frac{x}{\left( -\frac{2ac}{(a+b)} \right) - \left( \frac{-2ac}{(b-a)} \right)} = \frac{-y}{\left( -\frac{2ab}{(a+b)} \right) - \left( \frac{-2ab}{(a-b)} \right)} = \frac{1}{\left( \frac{2abc}{(b-a)(b+a)} \right) - \left( \frac{2abc}{(a-b)(a+b)} \right)}$$

$$\frac{x}{\left( \frac{-2ac(b-a) + 2ac(a+b)}{(a+b)(b-a)} \right)} = \frac{y}{\left( \frac{2ab(a-b) + (-2ab)(a+b)}{(a+b)(a-b)} \right)}$$

$$= \frac{1}{\left(\frac{2abc}{(b-a)(b+a)}\right) - \left(\frac{2abc}{(a-b)(a+b)}\right)}$$

$$\frac{x}{\left(\frac{4a^2c}{(a+b)(b-a)}\right)} = \frac{y}{\left(\frac{-4ab^2}{(a+b)(a-b)}\right)} = \frac{1}{\left(\frac{-4abc}{(a^2-b^2)}\right)}$$

$$\frac{x}{-4a^2c} = \frac{y}{-4ab^2} = \frac{1}{-4abc}$$

Consider the following for  $x$

$$\frac{x}{-4a^2c} = \frac{1}{-4abc}$$

$$\Rightarrow x = \frac{a}{b}$$

Now for  $y$

$$\frac{y}{-4ab^2} = \frac{1}{-4abc}$$

$$\Rightarrow y = \frac{b}{c}$$

Hence we get the value of  $x = \frac{a}{b}$  and  $y = \frac{b}{c}$

Pair of Linear Equations in Two variables Ex 3.4 Q20

**Answer :**

GIVEN:

$$(a-b)x + (a+b)y = 2a^2 - 2b^2$$

$$(a+b)(x+y) = 4ab$$

To find: The solution of the systems of equation by the method of cross-multiplication:

Here we have the pair of simultaneous equation

$$(a-b)x + (a+b)y - 2a^2 + 2b^2 = 0$$

$$(a+b)x + (a+b)y - 4ab = 0$$

By cross multiplication method we get

$$\frac{x}{(-4ab)(a+b) - (a+b)(-2a^2 + 2b^2)} = \frac{-y}{(-4ab)(a-b) - (a+b)(-2a^2 + 2b^2)}$$

$$= \frac{1}{(a+b)(a-b) - (a+b)^2}$$

$$\frac{x}{(a+b)((-4ab) - (-2a^2 + 2b^2))} = \frac{-y}{(-4ab)(a-b) - (a+b)(-2a^2 + 2b^2)}$$

$$= \frac{1}{(a+b)((a-b) - (a+b))}$$

Consider the following for  $x$

$$\frac{x}{(a+b)((-4ab) - (-2a^2 + 2b^2))} = \frac{1}{(a+b)((a-b) - (a+b))}$$

$$\frac{x}{(-4ab) - (-2a^2 + 2b^2)} = \frac{1}{(a-b) - (a+b)}$$

$$x = \frac{4ab + 2a^2 - 2b^2}{2b}$$

$$x = \frac{2ab + a^2 - b^2}{b}$$

Now consider the following for  $y$

$$\begin{aligned}\frac{-y}{(-4ab)(a-b)-(a+b)(-2a^2+2b^2)} &= \frac{1}{(a+b)((a-b)-(a+b))} \\ \frac{-y}{(-4ab)(a-b)-(a+b)(-2a^2+2b^2)} &= \frac{1}{(a+b)((a-b)-(a+b))} \\ \frac{y}{(4ab)(a-b)+(a+b)(-2a^2+2b^2)} &= \frac{1}{(a+b)(-2b)} \\ \frac{y}{(4ab)(a-b)+(a+b)(-2a^2+2b^2)} &= \frac{1}{(a+b)(-2b)} \\ \frac{y}{(4ab)(a-b)+(a+b)(-2)(a^2-b^2)} &= \frac{1}{(a+b)(-2b)} \\ \frac{y}{(4ab)(a-b)+(a+b)(-2)(a-b)(a+b)} &= \frac{1}{(a+b)(-2b)} \\ \frac{y}{(a-b)(a^2+b^2)} &= \frac{1}{(a+b)b} \\ y &= \frac{(a-b)(a^2+b^2)}{(a+b)b}\end{aligned}$$

Hence we get the value of  $x = \frac{2ab+b^2-a^2}{b}$  and  $y = \frac{(a-b)(a^2+b^2)}{(a+b)b}$

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