Exercise 3C

Question 15:

Let

$\frac{1}{x+y} = u$ and $\frac{1}{x-y} = v$

in the equation

$5u - 2v + 1 = 0$

$15u + 7v - 10 = 0$

$$\therefore \frac{u}{[-2\times(-10)-1\times 7]} = \frac{v}{1\times 15-(-10)\times 5} = \frac{1}{35+30}$$

$$\Rightarrow \quad \frac{u}{20-7} = \frac{v}{15+50} = \frac{1}{65}$$

$$\Rightarrow \quad \frac{u}{13} = \frac{v}{65} = \frac{1}{65}$$

$$\Rightarrow \quad \frac{u}{13} = \frac{1}{65}, \frac{v}{65} = \frac{1}{65}$$

$$\Rightarrow u = \frac{13}{65}, \quad v = \frac{65}{65}$$

$$\therefore u = \frac{1}{5}, v = 1$$

So, $\frac{1}{x+y} = \frac{1}{5}, \frac{1}{x-y} = 1$

$x + y = 5, x - y = 1$

By cross multiplication, we have

$$\frac{x}{[1\times(-1)-(-5)\times(-1)]} = \frac{y}{[(-5)\times 1-(-1)\times 1]} = \frac{1}{[1\times(-1)-1\times 1]}$$

$$\Rightarrow \frac{x}{(-1-5)} = \frac{y}{-5+1} = \frac{1}{-1-1}$$

$$\Rightarrow \quad \frac{x}{-6} = \frac{y}{-4} = \frac{1}{-2}$$

$$\Rightarrow \frac{x}{-6} = \frac{1}{-2}, \frac{y}{-4} = \frac{1}{-2}$$

$$\therefore x = \frac{-6}{-2} = 3 \qquad , y = \frac{-4}{-2} = 2$$

$\therefore$ the solution is $x = 3, y = 2$

Question 16:

The given equations are

$$\frac{ax}{b}-\frac{by}{a}-(a+b)=0$$

$$ax-by-2ab=0$$

By cross multiplication, we have

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

$$=\frac{1}{\frac{a}{b}\times(-b)-a\times\left(-\frac{b}{a}\right)}$$

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

$$\text{or } \frac{x}{2b^2-ab-b^2}=\frac{y}{-a^2-ab+2a^2}=\frac{1}{-a+b}$$

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

$$\Rightarrow \frac{x}{-b(a-b)}=\frac{y}{a(a-b)}=\frac{1}{-(a-b)}$$

$$\therefore \frac{x}{-b(a-b)}=\frac{1}{-(a-b)} \text{ and } \frac{y}{a(a-b)}=\frac{1}{-(a-b)}$$

$$\therefore x=\frac{-b(a-b)}{-(a-b)} \text{ and } y=\frac{a(a-b)}{-(a-b)}$$

$$\Rightarrow x=b, \quad \text{and} \quad y=-a$$

$\therefore$ the solution is x = b, y = -a

********** END **********