Question 15:

Let

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

in the equation

$$5u - 2v + 1 = 0$$

$$15u + 7v - 10 = 0$$

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

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

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

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

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

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

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

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

By cross multiplication, we have

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

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

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

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

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

$\therefore$ 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

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

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

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

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

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

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

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

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

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

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

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