Exercise 3C

Question 10:

2ax + 3by - (a + 2b) = 0

3ax + 2by - (2a + b) = 0

By cross multiplication, we have

$$\therefore \frac{x}{\left[3b\times(-(2a+b))-2b\times(-(a+2b))\right]}=\frac{y}{-(a+2b)\times 3a-2a\times(-(2a+b))}$$

$$=\frac{1}{2a\times 2b-3a\times 3b}$$

$$\therefore \frac{x}{\left[-6ab-3b^2+2ab+4b^2\right]}=\frac{y}{-3a^2-6ab+4a^2+2ab}=\frac{1}{4ab-9ab}$$

$$\Rightarrow \frac{x}{b^2-4ab}=\frac{y}{a^2-4ab}=\frac{1}{-5ab}$$

$$\Rightarrow \frac{x}{-b(4a-b)}=\frac{y}{-a(4b-a)}=\frac{1}{-5ab}$$

$$\Rightarrow \frac{x}{-b(4a-b)}=\frac{1}{-5ab},\ \frac{y}{-a(4b-a)}=\frac{1}{-5ab}$$

$$x=\frac{-b(4a-b)}{-5ab},\quad y=\frac{-a(4b-a)}{-5ab}$$

$x=\dfrac{(4a-b)}{5a}$, $y=\dfrac{(4b-a)}{5b}$ is the solution

Question 11:

$$\frac{x}{a}-\frac{y}{b}=0$$

$$ax+by-\left(a^2+b^2\right)=0$$

By cross multiplication, we have

$$\therefore \frac{x}{\left[\left(-\frac{1}{b}\right)\times\left(-\left(a^2+b^2\right)\right)-0\right]}=\frac{y}{\left[0-\frac{1}{a}\times\left(-\left(a^2+b^2\right)\right)\right]}=\frac{1}{\frac{b}{a}+\frac{a}{b}}$$

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

$$\Rightarrow \frac{x}{\left[\frac{(a^2+b^2)}{b}\right]}=\frac{y}{\left[\left(\frac{a^2+b^2}{a}\right)\right]}=\frac{1}{\left[\frac{(b^2+a^2)}{ab}\right]}$$

$$\frac{x}{\left(\frac{a^2+b^2}{b}\right)}=\frac{1}{\frac{(b^2+a^2)}{ab}}\ \text{and}\ \frac{y}{\left(\frac{a^2+b^2}{a}\right)}=\frac{1}{\left(\frac{b^2+a^2}{ab}\right)}$$

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

$\therefore$ The solution is x = a, y = b

Question 12:

$$\frac{x}{a}+\frac{y}{b}-2=0$$

$$ax-by-\left(a^2-b^2\right)=0$$

By cross multiplication, we have

$$\therefore \frac{x}{\left[\frac{1}{b}\left\{-\left(a^2-b^2\right)\right\}-(-2)(-b)\right]}=\frac{y}{\left[(-2a)-\frac{1}{a}\times\left\{-\left(a^2-b^2\right)\right\}\right]}=\frac{1}{-\frac{b}{a}-\frac{a}{b}}$$

$$\Rightarrow \frac{x}{\frac{-a^2}{b}+b-2b}=\frac{y}{\left[-2a+a-\frac{b^2}{a}\right]}=\frac{1}{\frac{-b^2-a^2}{ab}}$$

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

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

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

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

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

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