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exercise 3.4

$$2x - 3y - 12 = 0 \quad \text{--- (2)}$$

x	y	1
b_1	x_1	a_1
b_2	x_2	a_2

$\begin{array}{cc} x & y & 1 \\ \begin{array}{c} 2 \\ -3 \end{array} & \begin{array}{c} 1 \\ -12 \end{array} & \begin{array}{c} 1 \\ 2 \end{array} \end{array}$

$$\frac{x}{(2)(-12) - (-3)(1)} = \frac{y}{(1)(2) - (-12)(1)} = \frac{1}{(1)(-3) - (2)(2)}$$

$$\frac{x}{-24 + 3} = \frac{y}{2 + 12} = \frac{1}{-3 - 4}$$

$$\frac{x}{-21} = \frac{y}{14} = \frac{1}{-7}$$

$$\frac{x}{-21} = \frac{1}{-7}$$

$$x = \frac{723}{27}$$

$$x = 3$$

$$\frac{y}{14} = \frac{1}{-7}$$

$$y = 4 - 2$$

$$y = -2$$

$$3x + 4y = 65 \quad \longrightarrow \quad (2)$$

	x	y		z
1	$\nearrow$	$\searrow$	2	$\nearrow$
	-35			1
4	$\searrow$	$\nearrow$	3	$\searrow$
	-65			4

$$\frac{x}{(1)(-65) - (4)(-35)} = \frac{y}{(-35)(3) - (-65)(2)} = \frac{1}{(2)(4) - (3)(1)}$$

$$\frac{x}{-65 + 140} = \frac{y}{-105 + 130} = \frac{1}{8 - 3}$$

$$\frac{x}{75} = \frac{y}{25} = \frac{1}{5}$$

$$\frac{x}{75} = \frac{1}{5}$$

$$x = \frac{75}{5} = 15$$

$$\boxed{x = 15}$$

$$\frac{y}{25} = \frac{1}{5}$$

$$y = \frac{25}{5} = 5$$

$$\boxed{y = 5}$$

Q.5 $\frac{x+y}{xy} = 2$

$$\frac{x}{xy} + \frac{y}{xy} = 2$$

$$\frac{1}{y} + \frac{1}{x} = 2$$

$$\frac{1}{x} + \frac{1}{y} = 2 \quad \text{--- (1)}$$

$$\frac{x-y}{xy} = 6$$

$$\frac{x}{xy} - \frac{y}{xy} = 6$$

$$\frac{1}{y} - \frac{1}{x} = 6$$

$$-\frac{1}{x} + \frac{1}{y} = 6 \quad \text{--- (2)}$$

$$\frac{1}{x} = \frac{1}{y} = \frac{1}{1}$$

$$\begin{array}{ccc} 1 & \nearrow & -2 \\ 1 & \searrow & -6 \end{array} \quad \begin{array}{ccc} 1 & \nearrow & 1 \\ 1 & \searrow & -1 \end{array} \quad \begin{array}{ccc} 1 & \nearrow & 1 \\ 1 & \searrow & 1 \end{array}$$

$$\frac{1}{x} = \frac{1}{y} = \frac{1}{1}$$

$$\frac{(1)(-6) - (1)(-2)}{(1)(1) - (-1)(1)} = \frac{(1)(1) - (-6)(1)}{(1)(1) - (-1)(1)}$$

$$\frac{1}{x} = \frac{1}{y} = \frac{1}{1}$$

$$\frac{-6 + 2}{2 + 6} = \frac{1}{1 + 1}$$

$$\frac{1}{x} = \frac{1}{y} = \frac{1}{2}$$

$$\frac{-4}{8} = \frac{1}{2}$$

$$\frac{1}{x} = \frac{1}{2} \quad \left| \quad \frac{1}{y} = \frac{1}{2} \right.$$

$$\frac{-4}{8} = \frac{1}{2}$$

$$\frac{1}{x} = \frac{1}{2} \times 4$$

$$\boxed{x = -\frac{1}{2}}$$

$$\frac{1}{y} = \frac{1}{2} \times 4$$

$$\boxed{y = \frac{1}{4}}$$

Q.6

$$ax + by = a - b \quad \text{--- (1)}$$

$$bx - ay = a + b \quad \text{--- (2)}$$

$$\begin{array}{ccc} b & \nearrow & -a+b \\ -a & \searrow & -a-b \end{array} \quad \begin{array}{ccc} a & \nearrow & b \\ b & \searrow & -a \end{array}$$

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

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

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

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

$$x = 1$$

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

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

$$y = -1$$

Q.8 $ax + by = a^2$ ————— ①

$bx + ay = b^2$ ————— ②

$$\begin{array}{ccc} x & y & 1 \\ b \nearrow & \nearrow & \nearrow \\ a \searrow & \searrow & \searrow \\ -a^2 & -b^2 & a^2 - b^2 \end{array}$$

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

$$\frac{x}{-b^3 + a^3} = \frac{y}{-a^2b + ab^2} = \frac{1}{a^2 - b^2}$$

$$\frac{x}{-b^3 + a^3} = \frac{1}{a^2 - b^2}$$

$$x = \frac{-b^3 + a^3}{a^2 - b^2}$$

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

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

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

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

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

$$y = \frac{-ab}{a+b}$$

$$5 - 2 = -1 \quad \text{---} \quad \textcircled{1}$$

$$\begin{array}{r} x+y \\ x-y \end{array}$$

$$\frac{15}{x+y} + \frac{7}{x-y} = 10 \quad \text{--- (2)}$$

Let $\frac{u+v}{x+y} = A$ and $\frac{u-v}{x-y} = B$

$$\frac{5}{A} - \frac{2}{B} = -1 \quad \text{--- (3)}$$

$$\frac{15}{A} + \frac{7}{B} = 10 \quad \text{--- (4)}$$

$$\frac{1}{A} \quad \frac{1}{B} \quad \frac{1}{C}$$

$$\begin{array}{ccc} -2 & 1 & 5 \\ 7 & -10 & 15 \end{array} \quad \begin{array}{ccc} -2 & & \\ & & 7 \end{array}$$

$$\frac{1}{A} = \frac{1}{B} = \frac{1}{(5)(7) - (15)(-2)}$$

$$\frac{1}{A} = \frac{1}{B} = \frac{1}{35 + 30}$$

$$\frac{1}{20 - 7} = \frac{1}{15 + 50}$$

$$\frac{1}{A} = \frac{1}{B} = \frac{1}{65}$$

$\frac{1}{A} = \frac{1}{65}$ $\frac{1}{13} = \frac{1}{65} \times 13$ $\frac{1}{A} = \frac{1}{5}$ $x + y = 5 \quad \text{--- (5)}$	$\frac{1}{B} = \frac{1}{65}$ $\frac{1}{B} = \frac{1}{65} \times 65$ $x - y = 1 \quad \text{--- (6)}$
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Add (5) & (6),

$$\begin{array}{r}
 x + y = 5 \\
 (+) \quad x - y = 1 \\
 \hline
 2x = 6 \\
 x = \frac{6}{2} = 3 \\
 \boxed{x = 3}
 \end{array}$$

Putting value of x in (5)

$$\begin{array}{r}
 x + y = 5 \\
 3 + y = 5 \\
 y = 5 - 3 \\
 \boxed{y = 2}
 \end{array}$$

Q. 10

$$\begin{array}{r}
 2x + 3y = 13 \quad \text{--- (1)} \\
 5x - 4y = -2 \quad \text{--- (2)}
 \end{array}$$

$\frac{1}{x}$	$\frac{1}{y}$
$ \begin{array}{r} 3 \quad \swarrow \quad -13 \\ -4 \quad \searrow \quad 2 \end{array} $	$ \begin{array}{r} 2 \quad \swarrow \quad 3 \\ 5 \quad \searrow \quad -4 \end{array} $

$$\frac{1}{x} = \frac{1}{y} = \frac{1}{(2)(-4) - (5)(3)}$$

$$\frac{1}{(3)(2) - (-4)(-13)} \quad \frac{1}{(-13)(5) - (2)(2)}$$

$$\frac{1}{x} = \frac{1}{y} = \frac{1}{-8 - 15}$$

$$\frac{1}{6 - 52} \quad \frac{1}{-65 - 4}$$

$$\frac{1}{x} = \frac{1}{y} = \frac{1}{-23}$$

$$\frac{1}{-46} \quad \frac{1}{-69}$$

$$\frac{1}{x} = \frac{1}{-23}$$

$$\frac{1}{-46}$$

$$\frac{1}{y} = \frac{1}{-23}$$

$$\frac{1}{-69}$$

$$\frac{1}{x} = \frac{1}{-23} \quad x = \frac{-46}{2}$$

$$x = \frac{1}{2}$$

$$\frac{1}{y} = \frac{1}{-23} \quad y = \frac{-69}{3}$$

$$y = \frac{1}{3}$$

Q.11

$$\frac{57}{x+y} + \frac{6}{x-y} = 5 \quad \text{--- (1)}$$

$$\frac{38}{x+y} + \frac{21}{x-y} = 9 \quad \text{--- (2)}$$

Let $x+y = A$ and $x-y = B$

$$\frac{57}{A} + \frac{6}{B} = 5 \quad \text{--- (1)}$$

$$\frac{38}{A} + \frac{21}{B} = 9 \quad \text{--- (2)}$$

Wm

$$\frac{1}{A} \quad \frac{1}{B} \quad 1$$

$$\begin{array}{rcl} 6 & \nearrow & -5 \\ 21 & \searrow & -9 \end{array} \quad \begin{array}{rcl} 57 & \nearrow & \\ 38 & \searrow & \end{array} \quad \begin{array}{rcl} 6 & \nearrow & \\ 21 & \searrow & \end{array}$$

$$\frac{1}{A} = \frac{1}{B} = \frac{1}{1}$$

$$\frac{(6)(-9) - (21)(-5)}{(57)(21) - (38)(6)}$$

$$\frac{1}{A} = \frac{1}{B} = \frac{1}{1}$$

$$\frac{-54 + 105}{-190 + 513}$$

$$\frac{1}{A} = \frac{1}{B} = \frac{1}{969}$$

$$\frac{51}{323}$$

$$\frac{1}{A} = \frac{1}{969}$$

$$\frac{51}{323}$$

$$\frac{1}{A} = \frac{51}{969 \cdot 19}$$

$$A = 19$$

$$x + y = 19 \quad \text{--- (5)}$$

$$\frac{1}{B} = \frac{1}{969}$$

$$\frac{323}{969 \cdot 3}$$

$$\frac{1}{B} = \frac{323}{969 \cdot 3}$$

$$B = 3$$

$$x - y = 3 \quad \text{--- (6)}$$

Add (5) and (6),

$$\begin{aligned}x + y &= 19 \\ (+) \quad x + y &= 3 \\ \hline 2x &= 22 \\ x &= \frac{22}{2} = 11 \\ \boxed{x = 11}\end{aligned}$$

Putting value of x in (5),

$$\begin{aligned}x + y &= 19 \\ 11 + y &= 19 \\ y &= 19 - 11 \\ \boxed{y = 8}\end{aligned}$$

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classmate

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Q.12

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

$$xb + ay = 2ab \quad \text{--- (1)}$$

$$ax - by = a^2 - b^2 \quad \text{--- (2)}$$

$$\begin{array}{rcl} x & & y \\ a & \swarrow & \nearrow b \\ -b & \searrow & \swarrow a \end{array} \quad \begin{array}{rcl} & & 1 \\ & \swarrow & \nearrow a \\ & \searrow & \swarrow -b \end{array}$$

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

$$\frac{x}{-a^3+ab^2-2ab^2} = \frac{y}{-2a^2b+a^2b-b^3} = \frac{1}{-b^2-a^2}$$

$$\frac{x}{-a^3-ab^2} = \frac{y}{-b^3-a^2b} = \frac{1}{-a^2-b^2}$$

$$\frac{x}{-a^3-ab^2} = \frac{1}{-a^2-b^2}$$

$$x = \frac{-a^3-ab^2}{-a^2-b^2}$$

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

$$\boxed{x = a}$$

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

$$y = \frac{-b^3-a^2b}{-a^2-b^2}$$

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

$$\boxed{y = b}$$

Q.13

$$\frac{x}{a} + \frac{y}{b} = a+b$$

$$bx + ay = a^2b + ab^2 \quad \text{--- (1)}$$

$$bx + ay = a^2b + ab^2 \quad \text{--- (1)}$$

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

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

$$b^2x + a^2y = 2a^2b^2 \quad \text{--- (2)}$$

$$\begin{array}{rcl} x & & y \\ a & \nearrow & -a^2b^2 - ab^2 \\ a^2 & \searrow & -2a^2b^2 \end{array} \quad \begin{array}{rcl} & & 1 \\ & \nearrow & b \\ & \searrow & b^2 \end{array} \quad \begin{array}{rcl} & & 1 \\ & \nearrow & a^2 \\ & \searrow & a^2 \end{array}$$

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

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

$$\frac{x}{-2a^3b^2 + a^4b^2 - a^3b^2} = \frac{y}{-a^2b^4}$$

$$\frac{x}{-2a^3b^2 + a^4b + a^3b^2} = \frac{y}{-a^2b^3 - ab^4 + 2a^2b^3} = \frac{1}{a^2b - ab^2}$$

$$\frac{x}{-a^3b^2 + a^4b} = \frac{y}{+a^2b^3 - ab^4} = \frac{1}{a^2b - ab^2}$$

$$\frac{x}{-a^3b^2 + a^4b} = \frac{1}{a^2b - ab^2} \quad \frac{y}{-a^2b^3 - ab^4} = \frac{1}{a^2b - ab^2}$$

$$x = \frac{-a^3b^2 + a^4b}{a^2b - ab^2}$$

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

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

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

$$\boxed{x = a^2}$$

$$\frac{y}{-a^2b^3 - ab^4} = \frac{1}{a^2b - ab^2}$$

$$y = \frac{-a^2b^3 - ab^4}{a^2b - ab^2}$$

$$y = \frac{-ab^3(a+b)}{(a-b)(a+b)}$$

$$y = \frac{-ab^3(a+b)}{ab(a-b)}$$

$$y = -ab^2$$

$$\frac{y}{a^2b^3 - ab^4} = \frac{1}{a^2b - ab^2}$$

$$y = \frac{a^2b^3 - ab^4}{a^2b - ab^2}$$

$$y = \frac{ab^3(a-b)}{ab(a-b)}$$

$$y = \frac{a \times b^3}{a \times b}$$

$$y = b^2$$

Q. 15 $2ax + 3by = a + 2b$ ——— ①

$3ax + 2by = 2a + b$ ——— ②

$$\begin{array}{rcl} x & & y \\ 3b \nearrow & -a-2b & \\ 2b \searrow & -2a-b & \end{array}$$

$$\begin{array}{rcl} y & & x \\ 2a \nearrow & 3b & \\ 3a \searrow & 2b & \end{array}$$

$$\frac{x}{(3b)(-2a-b) - (2b)(-a-2b)} = \frac{y}{(-a-2b)(3a) - (-2a-b)(2a)}$$

$$\frac{x}{-6ab - 3b^2 + 2ab + 4b^2} = \frac{y}{-3a^2 - 6ab + 4a^2 + 2ab}$$

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

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

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

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

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

$$x = \frac{b-4a}{-5a}$$

$$\boxed{x = \frac{4a-b}{5a}}$$

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

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

$$y = \frac{a-4b}{-5b}$$

$$\boxed{y = \frac{4b-a}{5b}}$$

Q.17 $(a+2b)x + (2a-b)y = 2$ ————— ①

$(a-2b)x + (2a+b)y = 3$ ————— ②

$$\begin{array}{ccc} x & & y \\ \begin{array}{l} (a-b) \nearrow -2 \\ (2a+b) \searrow -3 \end{array} & \begin{array}{l} \nearrow \\ \searrow \end{array} & \begin{array}{l} (a+2b) \nearrow 1 \\ (a-2b) \searrow \end{array} \end{array}$$

$$\frac{x}{(2a-b)(-3) - (2a+b)(-2)} = \frac{y}{(-2)(a-2b) - (-3)(a+2b)} = \frac{1}{(a+2b)(2a+b) - (a-2b)(2a-b)}$$

$$\frac{x}{-6a+3b+4a+2b} = \frac{y}{-2a+4b+3a+6b} = \frac{1}{2a^2+ab+4ab+2b^2 - (2a^2-ab-4ab+2b^2)}$$

$$\frac{x}{5b-2a} = \frac{y}{a+10b} = \frac{1}{2a^2+5ab+2b^2 - 2a^2+5ab}$$

$$\frac{x}{5b-2a} = \frac{y}{a+10b} = \frac{1}{10ab}$$

$$\frac{x}{5b-2a} = \frac{1}{10ab}$$

$$x = \frac{5b-2a}{10ab}$$

$$\frac{y}{a+10b} = \frac{1}{10ab}$$

$$y = \frac{a+10b}{10ab}$$

Q.18

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

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

$$x \left(\frac{a^2+b^2-ab}{a-b} \right) - y \left(\frac{a^2+b^2+ab}{a+b} \right) = 0 \quad \text{--- (1)}$$

$$x+y = 2a^2 \quad \text{--- (2)}$$

$$\begin{array}{ccc} x & & y \\ - \left(\frac{a^2+b^2+ab}{a+b} \right) & \begin{array}{c} \nearrow \\ \searrow \end{array} & \left(\frac{a^2+b^2-ab}{a-b} \right) \\ 1 & -2a^2 & 1 \end{array}$$

$$\frac{x}{2a^2 \left(\frac{a^2+b^2+ab}{a+b} \right) - 0} = \frac{y}{0 + 2a^2 \left(\frac{a^2+b^2-ab}{a-b} \right)} =$$

$$\frac{1}{\frac{a^2+b^2-ab}{a-b} + \frac{a^2+b^2+ab}{a+b}}$$

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

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

$$\frac{x}{2a^2(a^2+ab+b^2)} = \frac{y}{2a^2(a^2-ab+b^2)} = \frac{1}{a^3+b^3+ab^2+a^2b-a^2b-ab^2+a^3+ab^2+ab^2-a^2b-ab^2-b^3}$$

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

$$\frac{x}{2a^2(a^2+ab+b^2)} = \frac{y}{2a^2(a^2-ab+b^2)} = \frac{1}{a^3+b^3+a^3-b^3}$$

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

$$\frac{x}{2a^2(a^2+ab+b^2)} = \frac{y}{2a^2(a^2-ab+b^2)} = \frac{1}{2a^3}$$

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

$$\frac{x}{2a^2(a^2+ab+b^2)} = \frac{1}{2a^3}$$

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

$$x = \frac{2a^3(a^2+ab+b^2)(a^2-b^2)}{2a^3(a+b)}$$

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

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

$$x = \frac{a^3-b^3}{a}$$

$$\frac{y}{2a^2(a^2-ab+b^2)} = \frac{1}{2a^3}$$

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

$$y = \frac{2a^3(a^2-ab+b^2)(a^2-b^2)}{2a^3(a-b)}$$

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

$$y = \frac{a^3 + b^3}{a}$$

Q.19 $bx + cy = a + b$ ————— ①

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

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

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

$$\begin{array}{ccc} x & & y \\ \begin{array}{c} c \\ \swarrow \quad \searrow \\ \frac{2ac}{b^2 - a^2} \end{array} & \begin{array}{c} -a-b \\ \swarrow \quad \searrow \\ \frac{-2a}{a+b} \end{array} & \begin{array}{c} b \\ \swarrow \quad \searrow \\ \frac{2ab}{a^2 - b^2} \end{array} \end{array}$$

$$\begin{aligned} x &= y \\ (c) \left(\frac{-2a}{a+b} \right) - \left(\frac{2ac}{b^2 - a^2} \right) (-a-b) &= (-a-b) \left(\frac{2ab}{a^2 - b^2} \right) - \left(\frac{-2a}{a+b} \right) (b) \\ &= \frac{(b) \left(\frac{2ac}{b^2 - a^2} \right) - \left(\frac{-2ab}{a^2 - b^2} \right) (c)}{1} \end{aligned}$$

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

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

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

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

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

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

$$x = \frac{-4a^2c}{-4abc / a^2 - b^2} \times \frac{a^2 - b^2}{a^2 - b^2}$$

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

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

$$y = \frac{-4ab^2}{-4abc / a^2 - b^2} \times \frac{a^2 - b^2}{a^2 - b^2}$$

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

Q.20 $(a-b)x + (a+b)y = 2a^2 - 2b^2$
 $(a-b)x + (a+b)y - 2(a^2 - b^2) = 0 \quad \text{--- (1)}$

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

$$(a+b)x + (a+b)y - 4ab = 0 \quad \text{--- (2)}$$

111111

$$\begin{array}{ccc} x & & y \\ \begin{array}{c} (a+b) \nearrow \\ (a+b) \searrow \end{array} & \begin{array}{c} -2(a^2-b^2) \\ -4ab \end{array} & \begin{array}{c} (a-b) \nearrow \\ (a+b) \searrow \end{array} \end{array}$$

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

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

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

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

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

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

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

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

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

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

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

Q. 21 $a^2x + b^2y = c^2$ ——— ①

$b^2x + a^2y = d^2$ ——— ②

$$\begin{array}{ccc} x & & y \\ \begin{array}{c} b^2 \nearrow \\ a^2 \searrow \end{array} & \begin{array}{c} -c^2 \\ -d^2 \end{array} & \begin{array}{c} a^2 \nearrow \\ b^2 \searrow \end{array} \end{array}$$

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

$$\frac{x}{-b^2d^2 + a^2c^2} = \frac{y}{-c^2b^2 + a^2d^2} = \frac{1}{a^4 - b^4}$$

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

$$x = \frac{a^2c^2 - b^2d^2}{a^4 - b^4}$$

$$\frac{y}{a^2d^2 - c^2b^2} = \frac{1}{a^4 - b^4}$$

$$y = \frac{a^2d^2 - c^2b^2}{a^4 - b^4}$$

Q. 23 $2(ax - by) + a + 4b = 0$

$2ax - 2by + (a + 4b) = 0$ ——— ①

$$2(bx + ay) + b - 4a = 0$$

$$2bx + 2ay + (b - 4a) = 0 \quad \text{--- (2)}$$

$$\begin{array}{ccc} \begin{array}{c} x \\ -2b \nearrow \\ 2a \searrow \end{array} & \begin{array}{c} y \\ a+4b \nearrow \\ b-4a \searrow \end{array} & \begin{array}{c} 1 \\ 2a \nearrow \\ 2b \searrow \end{array} \end{array} \begin{array}{c} -2b \\ +2a \end{array}$$

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

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

$$\frac{x}{-2b^2 + 8ab - 2a^2 - 8ab} = \frac{y}{2ab + 8b^2 - 2ab + 8a^2} = \frac{1}{4(a^2 + b^2)}$$

$$\frac{x}{-2(a^2 + b^2)} = \frac{y}{8(a^2 + b^2)} = \frac{1}{4(a^2 + b^2)}$$

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

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

$$\boxed{x = -\frac{1}{2}}$$

$$\frac{y}{8(a^2 + b^2)} = \frac{1}{4(a^2 + b^2)}$$

$$y = \frac{8(a^2 + b^2)}{4(a^2 + b^2)}$$

$$\boxed{y = 2}$$

$$Q-24 \quad 6(ax + by) = 3a + 2b$$

$$6ax + 6by - (3a + 2b) = 0 \quad \text{--- (1)}$$

$$6(bx - ay) = 3b - 2a$$

$$6bx - 6ay - (3b - 2a) = 0 \quad \text{--- (2)}$$

$$\begin{array}{rcl} x & & y \\ \begin{array}{l} 6b \nearrow \\ -6a \searrow \end{array} & \begin{array}{l} -(3a+2b) \\ -(3b-2a) \end{array} & \begin{array}{l} 6a \nearrow \\ 6b \searrow \end{array} \end{array} \quad \begin{array}{l} 1 - a + (3a+2b)a \\ -6b + 6a^2 + 3ab \end{array}$$

$$\begin{array}{rcl} x & & y \\ \hline -6b(3b-2a) - 6a(3a+2b) & & -6b(3a+2b) + 6a(3b-2a) \\ \hline & & 1 \\ & & (6a)(-6a) - (6b)(6b) \end{array}$$

$$\begin{array}{rcl} x & & y \\ \hline -18b^2 + 12ab - 18a^2 - 12ab & & -12ab - 12b^2 + 18ab - 12a^2 \\ \hline & & -36a^2 - 36b^2 \end{array}$$

$$\begin{array}{rcl} x & & y \\ \hline -18(a^2+b^2) & & -12(a^2+b^2) \end{array} = \frac{1}{-36(a^2+b^2)}$$

$$\begin{array}{l} x = \frac{1}{-18(a^2+b^2)} - \frac{1}{-36(a^2+b^2)} \\ x = \frac{-2 + 1}{-36(a^2+b^2)} \\ \boxed{x = \frac{1}{36(a^2+b^2)}} \end{array} \quad \begin{array}{l} y = \frac{1}{-12(a^2+b^2)} - \frac{1}{-36(a^2+b^2)} \\ y = \frac{-3 + 1}{-36(a^2+b^2)} \\ \boxed{y = \frac{1}{18(a^2+b^2)}} \end{array}$$

Q.25 $\frac{a^2}{x} - \frac{b^2}{y} = 0 \quad \text{--- (1)}$

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

Q

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

$$\begin{array}{ccc} -b^2 & 0 & a^2 \\ b^2a & -(a+b) & a^2b \end{array}$$

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

$$\frac{1}{b^2(a+b) - (b^2a)(0)} = \frac{1}{(0)(a^2b) + a^2(a+b)}$$

$$\frac{1}{x} = \frac{1}{y} = \frac{1}{a^3b^2 + a^2b^3}$$

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

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

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

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

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

$$\frac{1}{x} = \frac{1}{a^2}$$

$$\frac{1}{x} = \frac{1}{a^2}$$

$$\boxed{x = a^2}$$

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

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

$$\frac{1}{y} = \frac{1}{b^2}$$

$$\frac{1}{y} = \frac{1}{b^2}$$

$$\boxed{y = b^2}$$

Q.26 $mx - ny = m^2 + n^2$ ——— ①

$x + y = 2m$ ——— ②

$$\begin{array}{ccc} \begin{array}{cc} x & \\ -n & \nearrow \\ 1 & \searrow \end{array} & \begin{array}{cc} y & \\ -(m^2+n^2) & \nearrow \\ -2m & \searrow \end{array} & \begin{array}{cc} 1 & \\ m & \nearrow \\ 1 & \searrow \end{array} \end{array} \begin{array}{cc} & -n \\ & \nearrow \\ & \searrow \end{array}$$

$$\frac{x}{(-n)(-2m) - (1)(-m^2-n^2)} = \frac{y}{(-m^2-n^2)(1) - (-2m)(m)} = \frac{1}{(m)(1) - (1)(-n)}$$

$$\frac{x}{2mn + (m^2+n^2)} = \frac{y}{-(m^2+n^2) + 2m^2} = \frac{1}{m+n}$$

$$\frac{x}{m^2+n^2+2mn} = \frac{y}{-m^2-n^2+2m^2} = \frac{1}{m+n}$$

$$\frac{x}{(m+n)^2} = \frac{y}{m^2-n^2} = \frac{1}{m+n}$$

$$\frac{x}{(m+n)^2} = \frac{1}{m+n}$$

$$x = \frac{(m+n)^2}{m+n}$$

$$\boxed{x = m+n}$$

$$\frac{y}{m^2-n^2} = \frac{1}{m+n}$$

$$y = \frac{(m+n)(m-n)}{(m+n)}$$

$$\boxed{y = m-n}$$

~~$$Q.27 \quad \frac{ax}{b} - \frac{by}{a} = a+b$$~~

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

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

~~$$ax - by = 2ab \quad \text{--- ②}$$~~

$$\begin{array}{cc} x & y \\ \begin{array}{c} -b^2 \\ -b \end{array} & \begin{array}{c} - (a^2b + ab^2) \\ -2ab \end{array} \end{array} \quad \begin{array}{cc} 1 & \\ \begin{array}{c} a^2 \\ a \end{array} & \begin{array}{c} -b^2 \\ -b \end{array} \end{array}$$

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

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

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

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

Q.27 $\frac{ax}{b} - \frac{by}{a} = a + b$ ——— (1)

$ax - by = 2ab$ ——— (2)

$$\begin{array}{cc} x & y \\ \begin{array}{c} -b \\ a \end{array} & \begin{array}{c} -(a+b) \\ -2ab \end{array} \end{array} \quad \begin{array}{cc} 1 & \\ \begin{array}{c} a \\ b \end{array} & \begin{array}{c} -b \\ a \end{array} \end{array}$$

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

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

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

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

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

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

$$\boxed{x = b}$$

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

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

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

$$\boxed{y = -a}$$

Q.28 $\frac{bx}{a} + \frac{ay}{b} - (a^2 + b^2) = 0$ ——— ①

$$x + y - 2ab = 0$$
 ——— ②

$$\begin{array}{ccc} \frac{a}{b} & \begin{array}{c} \nearrow - (a^2 + b^2) \\ \searrow - 2ab \end{array} & \frac{b}{a} \\ 1 & & 1 \end{array}$$

$$\left(\frac{a}{b}\right)(-2ab) - (1)(-a^2 - b^2) = (-a^2 - b^2)(1) - (-2ab)\left(\frac{b}{a}\right)$$

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

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

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

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

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

$$\boxed{x = ab}$$

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

$$y = \frac{b^2 - a^2}{b^2 - a^2} \times ab$$

$$\boxed{y = ab}$$