

S.1 Systems of linear eqs. in two variables

10 Solve.

ex.1

$$\begin{aligned} \textcircled{1} \quad 2x + 5y &= 15 \\ \textcircled{2} \quad 4x + y &= 21 \end{aligned}$$

comb. $\textcircled{1} - 5\textcircled{2}$

$$\begin{aligned} &2x + 5y = 15 \\ &-20x - 5y = -105 \\ \hline &-18x = -90 \\ &\frac{-18x}{-18} = \frac{-90}{-18} \end{aligned}$$

$$x = 5$$

answer
(5, 1)
x y

Back-sub into $\textcircled{1}$ or $\textcircled{2}$

$$\begin{aligned} \textcircled{1} \quad 2(5) + 5y &= 15 \\ 10 + 5y &= 15 \\ -10 &-10 \\ \hline 5y &= 5 \\ y &= 1 \end{aligned}$$

28

Solve.

$$4x - 3y = 28$$

$$9x - y = -6$$

$$\left[\begin{array}{l} +6 \downarrow +y \quad +6 +y \\ 9x - y = -6 \end{array} \right]$$

$9x + 6 = y \rightarrow$ sub into other eq.

$$\begin{aligned} 9(-2) + 6 &= y \\ -18 + 6 &= y \\ -12 &= y \end{aligned}$$

$(-2, -12)$

$$4x - 3(9x + 6) = 28$$

$$4x - 27x - 18 = 28$$

$$\begin{aligned} -23x &= 46 \\ \frac{-23x}{-23} &= \frac{46}{-23} \end{aligned}$$

$$x = -2$$

ex. 3 Solve

$$\textcircled{1} \quad x + 4y = 8$$

$$\textcircled{2} \quad 3x + 12y = 2$$

$$-3\textcircled{1} + \textcircled{2}$$

$$-3x - 12y = -24$$

$$3x + 12y = 2$$

$$0 = -22$$

false, so no solution

ex. 4 solve

$$\textcircled{1} \quad 2x - 6y = 10$$

$$\textcircled{2} \quad -3x + 9y = -15$$

$$3\textcircled{1} + 2\textcircled{2}$$

$$6x - 18y = 30$$

$$-6x + 18y = -30$$

$$0 = 0$$

True, Inf. ~~re~~ many solutions.

How do we answer.

$\textcircled{1}$

$$2x - 6y = 10$$

Solve for 'x'

$$\rightarrow 2x = 6y + 10$$

$$x = 3y + 5$$

$$(3y + 5, y)$$

5.1 Solving systems of linear equations with two Var.

ex. 1 Solve

Subs. Method

$$\begin{aligned} -x + y &= 2 \\ 4x - 3y &= -3 \end{aligned}$$

add x

$$y = x + 2$$

sub into other eq

$$4x - 3(x + 2) = -3$$

$$4x - 3x - 6 = -3$$

$$x - 6 = -3$$

$$+6 \quad +6$$

$$x = 3$$

Back sub. to solve for "y"

$$y = 3 + 2$$

$$y = 5$$

$(3, 5)$
x y

ex. Solve

- ① $2x - 5y = -18$
- ② $3x + 4y = 19$

elim. method (Let's elim. "x")

$$\begin{aligned} 3 \text{ ①} - 2 \text{ ②} & \rightarrow \begin{aligned} 6x - 15y &= -54 \\ -6x - 8y &= -38 \\ \hline -23y &= -92 \\ \hline y &= 4 \end{aligned} \end{aligned}$$

$$3x + \underbrace{4(4)}_{16} = 19$$

$$3x = 3$$

$$x = 1$$

$(1, 4)$

ex. 3

$$\begin{aligned} \textcircled{1} \quad & \frac{1}{3}x - \frac{1}{4}y = 2 \\ \textcircled{2} \quad & -8x + 6y = 10 \end{aligned}$$

~~$$\begin{aligned} -8x + 6y &= 10 \\ 6y &= 8x + 10 \\ y &= \frac{4}{3}x + \frac{5}{3} \end{aligned}$$~~

$$\begin{aligned} 12 \textcircled{1} \quad & 4x - 3y = 24 \\ & -8x + 6y = 10 \\ & \downarrow \\ & -4x + 3y = 5 \\ & 4x - 3y = 24 \end{aligned}$$

$$0 = 29$$

false, no solution

ex. 4

$$\begin{aligned} & 2x - 6y = 10 \\ & -3x + 9y = -15 \end{aligned}$$

$$\rightarrow 2x - 6y = 10$$

$$2x = 6y + 10$$

$$x = 3y + 5$$

$$\left(\underset{x}{3y+5}, \underset{y}{y} \right)$$

$$-3(3y+5) + 9y = -15$$

$$-9y - 15 + 9y = -15$$

$$\underline{-15 = -15}$$

?

Inf. many solutions

5.1 H.W.

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① $x + 2y = 3$

② $5x - y = 4$

① + 2② → $x + 2y = 3$
 $10x - 2y = 8$
elim.

combine

$$11x = 11$$

$$x = 1$$

$$(1, 1)$$

sub $x=1$ into ①

$$\begin{array}{r} 1 + 2y = 3 \\ -1 = -1 \\ \hline 2y = 2 \\ y = 1 \end{array}$$

H.W.

8 ① $\frac{3}{4}x + \frac{1}{2}y = 5$

② $-\frac{1}{4}x - \frac{3}{2}y = 1$

3① + ② → $\frac{9}{4}x + \frac{3}{2}y = 15$
→ $-\frac{1}{4}x - \frac{3}{2}y = 1$

$$\frac{8}{4}x = 16$$

$$\downarrow$$
$$2x = 16$$

$$x = 8$$

5.1.
H.W. #. 8 (similar)

$$-\frac{1}{3}x - \frac{1}{6}y = -1$$

$$\frac{2}{3}x + \frac{1}{6}y = 3$$

elim. ("y")

$$-\frac{1}{3}x - \frac{1}{6}y = -1$$

$$\frac{2}{3}x + \frac{1}{6}y = 3$$

$$\left(\frac{3}{1}\right) \frac{1}{3}x$$

$$= 2 \left(\frac{3}{1}\right)$$

$$x = 6$$

Sub into "top"

$$-\frac{1}{3}(6) - \frac{1}{6}y = -1$$

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

$$+2$$

$$+2$$

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

$$y = -6$$

$$(6, -6)$$