

3.2 Solving Systems Algebraically

Ex: Solve by Substitution

$$\begin{aligned}4x - y &= 2 \\5x + 2y &= 9\end{aligned}$$

① Solve for y in the 1st equation

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

② "Substitute"

$$5x + 2y = 9$$

$$5x + 2(4x - 2) = 9$$

③ Solve

$$5x + 8x - 4 = 9$$

$$13x = 13$$

$$x = 1$$

④ "Back-Substitute"

$$y = 4x - 2$$

$$y = 4(1) - 2$$

$$y = 4 - 2$$

$$y = 2$$

⑤ Solution $(1, 2)$

Ex: SOLVE $4X - 3Y = 2$
 $5X + 2Y = -1$

$$4X - 3Y = 2$$

$$\begin{array}{r} \underline{-4X} \qquad \qquad \underline{-4X} \\ -3Y = -4X + 2 \end{array}$$

$$Y = \frac{4}{3}X - \frac{2}{3}$$

$$5X + 2\left(\frac{4}{3}X - \frac{2}{3}\right) = -1$$

$$5X + \frac{8}{3}X - \frac{4}{3} = -1$$

$$\frac{23}{3}X - \frac{4}{3} = -1$$

$$\frac{23}{3}X = \frac{1}{3}$$

$$\left(\frac{3}{23}\right) \frac{23}{3}X = \frac{1}{3} \left(\frac{3}{23}\right)$$

$$X = \frac{1}{23}$$

$$Y = \frac{4}{3} \left(\frac{1}{23}\right) - \frac{2}{3}$$

$$Y = \frac{4}{69} - \frac{2}{3}$$

$$Y = \frac{4}{69} - \frac{46}{69}$$

$$Y = \frac{-42}{69}$$

$$Y = \frac{-14}{23}$$

$$\left(\frac{1}{23}, -\frac{14}{23}\right)$$

H.W.: 18-29, 36-41 ALL BY SUBSTITUTION

3.2 CONTINUED

METHOD OF ELIMINATION

CONSIDER

$$\begin{array}{r} 2x + y = 13 \\ x - y = 5 \end{array}$$

$$\begin{array}{r} 3x = 18 \\ x = 6 \end{array}$$

$$\begin{array}{r} x - y = 5 \\ 6 - y = 5 \\ -y = -1 \\ y = 1 \end{array}$$

$$(6, 1)$$

Ex: SOLVE $\begin{array}{r} x - 3y = -3 \\ 2x + y = 8 \end{array}$

MULTIPLY 1ST EQUATION BY -2

$$\begin{array}{r} -2x + 6y = 6 \\ 2x + y = 8 \end{array}$$

$$7y = 14$$

$$y = 2$$

$$\begin{array}{r} 2x + y = 8 \\ 2x + 2 = 8 \\ 2x = 6 \\ x = 3 \end{array}$$

$$(3, 2)$$

EX: SOLVE $3X - 2Y = 5$
 $4X + 3Y = -1$

MULTIPLY EQUATION 1 BY 3
MULTIPLY EQUATION 2 BY 2

$$9X - 6Y = 15$$

$$8X + 6Y = -2$$

$$17X = 13$$

$$X = \frac{13}{17}$$

EITHER PLUG $X = \frac{13}{17}$ INTO ONE OF THE ORIGINAL EQUATIONS OR ELIMINATE THE X

$$12X - 8Y = 20$$

$$-12X - 9Y = 3$$

$$-17Y = 23$$

$$Y = -\frac{23}{17}$$

$$\left(\frac{13}{17}, -\frac{23}{17} \right)$$

HW: 18-29, 36-41