

Section 4.2 - Systems of Equations (Substitution)

For substitution, we solve for x or y in one equation. Then substitute the expression for x or y into the second equation to solve for one variable.

Then plug the answer into either equation to find the second variable. Check your answer.

Ex) $\begin{cases} y = 3x - 2 \\ 2x + y = 8 \end{cases} \quad \begin{cases} x + 4y = 7 \\ x = 6y - 3 \end{cases}$] Variable is already found

$\begin{cases} 4x + 27 = 7y \\ x = -5y \end{cases} \quad \begin{cases} 3x + 40 = 8y \\ x = -4y \end{cases}$

$$\begin{cases} 4x + y = 3 \\ 3x + 5y = 15 \end{cases} \quad \begin{cases} 2x - 3y = 10 \\ 3x + y = 15 \end{cases}$$

$$\begin{cases} 3a - 3b = 5 \\ 3 - a = 3b \end{cases} \quad \begin{cases} 2s - t = 4 \\ 3s - 5t = 2 \end{cases}$$

$$\begin{cases} \frac{y}{4} = \frac{-x}{2} - \frac{3}{4} \\ 2x - y = -1 + y - x \end{cases} \quad \begin{cases} \frac{y}{6} = \frac{x}{3} + \frac{1}{2} \\ 2x - y = -3 + y - x \end{cases}$$

$$\begin{cases} 4y - 12 = x \\ y = \frac{1}{4}x \end{cases} \quad \begin{cases} x - 4 = y \\ -2y = 4 - 2x \end{cases}$$

$$\begin{cases} \cancel{x - 4 = y} \\ \cancel{-2y = 4 - 2x} \end{cases} \quad \begin{cases} x = -3y + 6 \\ 2x + 6y = 12 \end{cases} \quad \begin{cases} y = 2 - x \\ 3x + 3y = 6 \end{cases}$$

§ 4.3 - Systems of Equations (Elimination)

We will multiply one of the equations by a number (if necessary) ~~to~~ when we add the two equations, one variable is cancelled out, so we solve for the other.

Then use either equation to find the second variable.

$$\text{Ex)} \quad \begin{cases} 2x + 5y = 11 \\ 6x - 5y = 13 \end{cases} \quad \begin{cases} -4x + 3y = 4 \\ 4x + 5y = 28 \end{cases}$$

$$\begin{cases} 2x + 7y = -18 \\ 2x + 3y = -10 \end{cases} \quad \begin{cases} 2x + 7y = -27 \\ 3x + 7y = -30 \end{cases}$$

$$\begin{cases} 7x + 2y - 11 = 0 \\ 9x = 4y - 28 \end{cases} \quad \begin{cases} 3x = 10 - 2y \\ 5x - 6y + 30 = 0 \end{cases}$$

$$\begin{cases} 4a + 7b = -8 \\ 5a + 6b = 1 \end{cases} \quad \begin{cases} 5a + 3b = -7 \\ 3a + 4b = 9 \end{cases}$$

$$\begin{cases} \frac{1}{6}x + \frac{1}{2}y = \frac{1}{3} \\ -\frac{x}{9} + y = \frac{5}{9} \end{cases} \quad \begin{cases} -\frac{1}{5}x + y = \frac{8}{5} \\ \frac{x}{8} + \frac{y}{2} = \frac{1}{4} \end{cases}$$

$$\begin{cases} 3x - 2y = 2 \\ -3x + 2y = -12 \end{cases} \quad \begin{cases} 2x - 7y = 5 \\ -2x + 7y = 3 \end{cases}$$

$$\begin{cases} \frac{2x - 5y}{15} = \frac{8}{15} \\ -0.2x + 0.5y = -0.8 \end{cases} \quad \begin{cases} \frac{3x + y}{6} = \frac{1}{3} \\ -0.3x - 0.1y = 0.2 \end{cases}$$

Section 4.4 - Problem-Solving

Steps to solve problems

- ① Write down given information
- ② Assign variables (such as x and y) to represent the unknown quantities.
- ③ For the system of equations (the chart method can be very useful here)
- ④ Solve the system using substitution or elimination.
- ⑤ State solution with units.
- ⑥ Check to see if answers make sense (No - answers for lengths!)

Examples: See Ex 1 p. 315 → General Prob.
Ex 2 p. 316 → Geometry Prob
Ex 3 p. 317 → Perimeter Prob.
Ex 5 p. 319 → Interest Prob.
Ex 6 p. 320-1 → Distance Prob
Ex 7 p. 321-2 → Solution Prob
Ex 8 p. 322-3 → Mixture Prob.



4.5 - Solving Systems of Inequalities

Instead of solving a system of equations (= signs)
we will have inequalities ($>$, $<$, \geq , \leq)


Steps for solving by graphing.

① Draw the first line ($y = mx + b$ is easiest to use) (Pretend it's $=$)

Using solid line — for \leq or \geq
and dashed line --- for $<$ or $>$

② Shade using one style for first line say
 or 

③ Repeat steps ① and ② for second line and use
different shading than first line

④ Label solution set with 

⑤ Pick a test point to check answer.

$$\text{Ex) } \begin{cases} x + y \geq -1 \\ x - y \geq 1 \end{cases} \quad \begin{cases} x - y \leq 2 \\ x + y \geq -1 \end{cases} \quad \begin{cases} y > 3x \\ 2x + y < 4 \end{cases}$$

$$\begin{cases} x + 3y < 3 \\ y > \frac{1}{3}x \end{cases} \quad \begin{cases} x \leq 2 \\ y > 3 \end{cases} \quad \begin{cases} y \leq 1 \\ x > 2 \end{cases}$$

$$\begin{cases} x \geq 0 \\ y \geq 0 \\ x + 2y \leq 6 \end{cases} \quad \begin{cases} x \leq 1 \\ y \leq 2 \\ 2x - y \leq 4 \end{cases}$$