

Description of Lines	How Many Points of Intersection?	Equal Slopes? (yes/no)	Same y-intercepts (yes/no)	Classify the System
Intersecting	one	no	maybe	independent
Parallel	zero	yes	no	inconsistent
Coinciding	infinite	yes	yes	dependent

A system of equations is a set of two or more equations that use the same variables.

Solving systems algebraically is more exact than solving by graphing.

SUBSTITUTION—Substitute an expression in for a variable and solve for another variable to find the intersection point (the solution).

Solve by substitution.

$$\begin{cases} 2x - 3y = 6 \\ x + y = -12 \end{cases} \rightarrow x = (-12 - y)$$

$$2(-12 - y) - 3y = 6$$

$$\begin{aligned} -24 - 2y - 3y &= 6 \\ -24 - 5y &= 6 \\ -5y &= 30 \\ y &= -6 \end{aligned}$$

$$\begin{aligned} x &= -12 - (-6) \\ &= -12 + 6 \\ x &= -6 \end{aligned}$$

$$\begin{aligned} 2(-6) - 3(-6) &= 6 \\ -12 + 18 &= 6 \\ 6 &= 6 \end{aligned}$$

(-6, -6)

Solve by substitution.

$$\begin{cases} 3x - y = 0 \\ 4x + 3y = 26 \end{cases}$$

Solve by substitution.

At Renaldi's Pizza, a soda and two slices of pizza costs \$10.25. A soda and four slices of pizza costs \$18.75. Find the cost of each item.

$$\begin{cases} x + 2y = 10.25 \\ (x) + 4y = 18.75 \end{cases} \rightarrow x = (10.25 - 2y)$$

$$10.25 - 2y + 4y = 18.75$$

$$\begin{aligned} 10.25 + 2y &= 18.75 \\ 2y &= 8.50 \\ y &= 4.25 \end{aligned}$$

$$\begin{aligned} x + 2(4.25) &= 10.25 \\ x + 8.50 &= 10.25 \\ x &= 1.75 \end{aligned}$$

ELIMINATION-solving a system by eliminating a variable by adding the two equations together.

Solve by elimination.

$$\begin{cases} 3x - 2y = 14 \\ 2x + 2y = 6 \end{cases}$$

$$5x = 20$$

$$x = 4$$

$$3(4) - 2y = 14$$

$$12 - 2y = 14$$

$$-2y = 2$$

$$y = -1$$

(4, -1)
independent

Solve by elimination.

$$\begin{cases} (3x + 7y = 15) \cdot 2 \\ (5x + 2y = -4) \cdot -7 \end{cases}$$

$$\begin{array}{r} 6x + 14y = 30 \\ -35x - 14y = 28 \\ \hline \end{array}$$

$$-29x = 58$$

$$x = -2$$

$$3(-2) + 7y = 15$$

$$-6 + 7y = 15$$

$$7y = 21$$

$$y = 3$$

(-2, 3)

independent

Solve by elimination.

$$\begin{cases} (2x + 4y = -4) \cdot 3 \\ (3x + 5y = -3) \cdot -2 \end{cases}$$

$$\begin{array}{r} 6x + 12y = -12 \\ -6x - 10y = 6 \end{array}$$

$$2y = -6$$

$$y = -3$$

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

$$2x - 12 = -4$$

$$2x = 8$$

$$x = 4$$

(4, -3)

independent

Solve.

$$\begin{cases} (-3x + 5y = 7) \cdot 2 \\ 6x - 10y = -14 \end{cases}$$

$$-6x + 10y = 14$$

$$6x - 10y = -14$$

$$0 + 0 = 0$$

$$0 = 0$$

infinite solutions
dependent

Solve.

$$\begin{cases} (-2x + 4y = 6) \cdot 3 \\ (-3x + 6y = 8) \cdot 2 \end{cases}$$

$$\begin{aligned} 6x - 12y &= -18 \\ -6x + 12y &= 16 \end{aligned}$$

$$0 \neq -2$$

no solution
inconsistent system

Solve.

$$\begin{cases} x - 3y = 2 \\ 4x - 12y = 8 \end{cases}$$

Homework

page 119 # 25, 27, 29, 34, 37

page 126 # 8, 11, 22, 32, 35, 46, 49