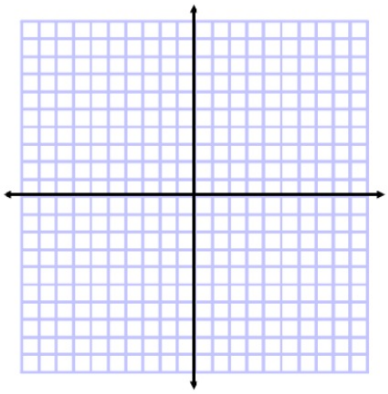
Algebra 2 3.1

Solve systems of linear equations graphically* *Algebra 1 Ch. 7

Solve systems of linear equations algebraically*

system
no solution
infinitely many solutions
consistent
independent
dependent
inconsistent
substitution method (cut & paste)
elimination method (cancel...zero pairs)
whiteboards

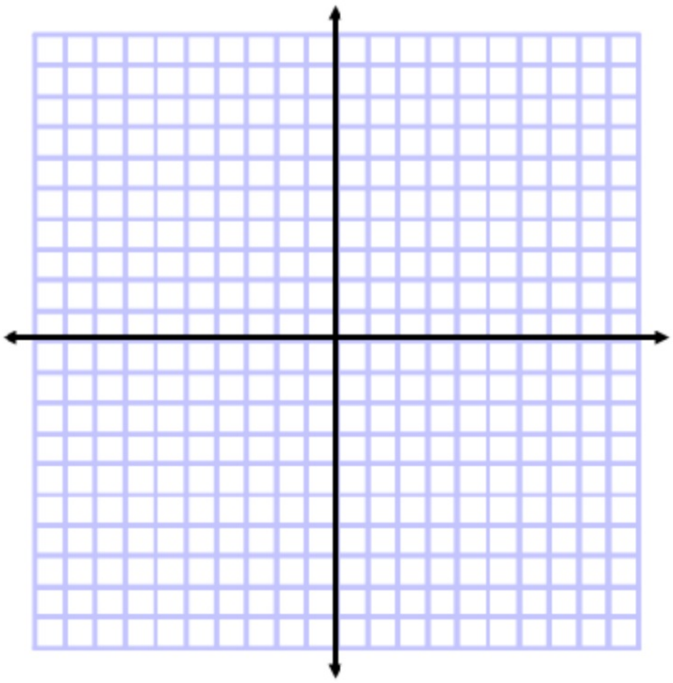


Example 2 Solve by Graphing

Solve the system of equations by graphing.

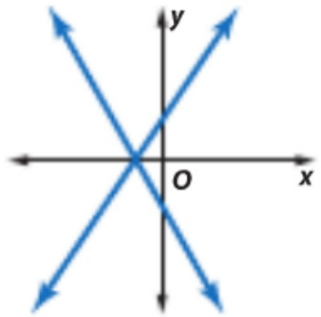
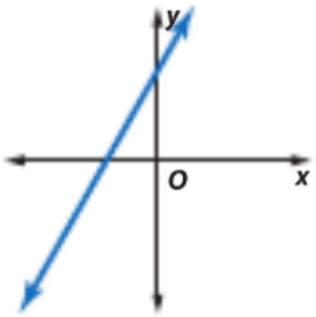
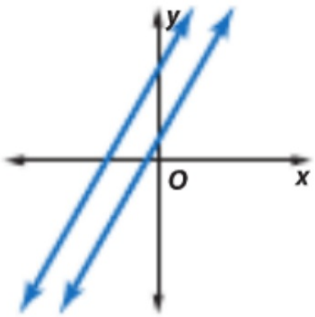
$2x - y = -1$ $\qquad$ $2y + 5x = -16$

Advantages: Disadvantages



p. 138

ConceptSummary Characteristics of Linear Systems

Consistent and Independent	Consistent and Dependent	Inconsistent
		
intersecting lines; one solution	same line; infinitely many solutions	parallel lines; no solution

KeyConcept Substitution Method

Step 1 Solve one equation for one of the variables.

Step 2 Substitute the resulting expression into the other equation to replace the variable. Then solve the equation.

Step 3 Substitute to solve for the other variable.

11 $5 \cdot 4 - 3 \cdot -1 = 23$

$20 + 3 = 23$

Guided Practice

Use substitution to solve each system of equations.

4A. $5x - 3y = 23$
$2x + y = 7$

$-2x \quad -2x$

4B. $x - 7y = 11$
$5x + 4y = -23$

$(\quad) = (-2x + 7)$

$y = -2 \cdot 4 + 7$

$5x - 3(-2x+7) = 23$

$5x + 6x - 21 = 23$

$11x - 21 = 23$

$+21 \quad +21$

$\frac{11x}{11} = \frac{44}{11}$

Strategy...

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4C. $-6x - y = 27$
$3x + 8y = 9$

KeyConcept Elimination Method

Step 1 Multiply one or both equations by a number to result in two equations that contain opposite terms.

Step 2 Add the equations, eliminating one variable. Then solve the equation.

Step 3 Substitute to solve for the other variable.

(-2, -3)

$5x + 3y = -19$
$8x + 3y = -25$ $\cdot -1$

Notice that solving by substitution would involve fractions.

$8 \cdot -2 + 3 \cdot 3 = -25$
$-16 + 9 = -25$

$5 \cdot -2 + 3y = -19$
$-10 + 3y = -19$
$+10 \quad +10$
$3y = -9$
$\frac{3y}{3} = \frac{-9}{3}$

$5x + 3y = -19$
$-8x - 3y = 25$
$-3x = 6$
$\frac{-3x}{-3} = \frac{6}{-3}$
$x = -2$

GuidedPractice

5A. $4x - 3y = -22$
$2x + 3y = 16$

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5B. $6x - 5y = -8$
$4x - 5y = -12$

5C. $2x - 9y = 34$
$-2x + 6y = -28$

Standardized Test Example 6 No Solution and Infinite Solutions

Solve the system of equations.

$5x + 3y = 52$ $\xrightarrow{-3}$ $-15x - 9y = -156$

$15x + 9y = 54$ $\rightarrow$ $15x + 9y = 54$

$0 + 0 = -102$

$0 = -102$

F

NS

Inf many

$3 = 3$

T

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GuidedPractice

6. Solve the system of equations. $2x + 3y = 5$
$6x + 9y = 15$

$-3 \rightarrow -6x - 9y = -15$
$6x + 9y = 15$

F $(-2, 3)$ G $(7, 3)$ H no solution J infinite solutions

ConceptSummary Solving Systems of Equations

Method	The Best Time to Use
Table	to estimate the solution, since a table may not provide an exact solution
Graphing	to estimate the solution, since graphing usually does not give an exact solution
Substitution	if one of the variables in either equation has a coefficient of 1 or −1
Elimination Using Addition	if one of the variables has opposite coefficients in the two equations
Elimination Using Subtraction	if one of the variables has the same coefficient in the two equations
Elimination Using Multiplication	if none of the coefficients are 1 or −1 and neither of the variables can be eliminated by simply adding or subtracting the equations

p. 140

x =
y =

do something

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