Systems of Equations

A System of equations is a set of two or more equations that use ~~the same~~ variables

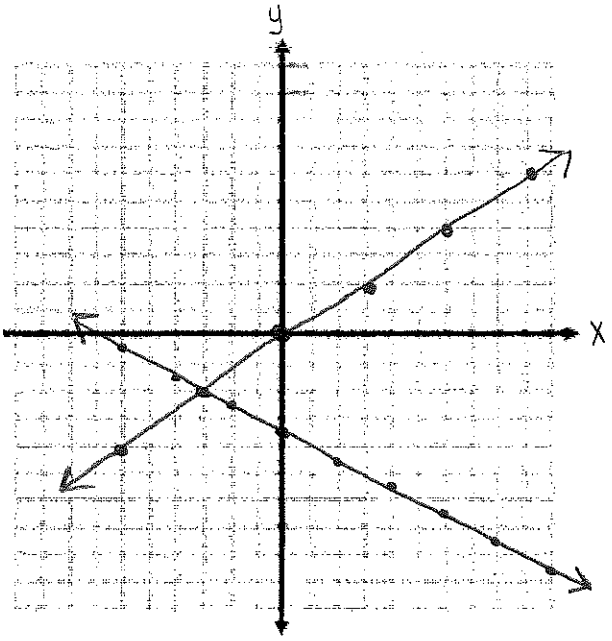
If the graph of each equation in a system of two variables is a line, then the system is a linear system.

Solving Systems by Graphing

Example 1

a) $x + 2y = -7$
$2x - 3y = 0$

(-3, -2)



$x + 2y = -7$
$-x \quad -x$

$\frac{2y}{2} = -\frac{x}{2} - \frac{7}{2}$

$y = -\frac{1}{2}x - 3.5$

$2x - 3y = 0$
$-2x \quad -2x$

$\frac{-3y}{-3} = -\frac{2x}{-3}$

$y = \frac{2}{3}x$

Solving Systems by Substitution

Example 2

a) $2x - 3y = 6$
$x + y = -12$
$-y \quad -y$

$x = -12 - y$

(-6, -6)

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

$-24 - 2y - 3y = 6$

$-24 - 5y = 6$

$+24 \quad +24$

$\frac{-5y}{-5} = \frac{30}{-5}$

$y = -6$

$x + (-6) = -12$

$x - 6 = -12$

$+6 \quad +6$

$x = -6$

Check:

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

$-12 + 18 = 6$

$6 = 6$

b) $3x - y = 0$
$4x + 3y = 26$

(2, 6)

$3x - y = 0$

$+y \quad +y$

$3x = y$

$4x + 3(3x) = 26$

$4x + 9x = 26$

$\frac{13x}{13} = \frac{26}{13}$

$x = 2$

$3(2) - y = 0$

$6 - y = 0$

$-6 \quad -6$

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

$y = 6$

* Get one set of coefficients opposite, then add the two equations together.

Solving Systems by Elimination

Example 3

a) $3x - 2y = 14$
$2x + 2y = 6$

$\frac{5x}{5} \quad \frac{0}{} = \frac{20}{5}$

$x = 4$

$3(4) - 2y = 14$
$12 - 2y = 14$
$-12 \quad -12$

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

$y = -1$

Check:
$2(4) + 2(-1) = 6$
$8 - 2 = 6$
$6 = 6$

$(4, -1)$

b) $4x + 9y = 1$
$(4x + 6y = -2)(-1)$ ⟶

$4x + 9y = 1$
$-4x - 6y = 2$

$\frac{3y}{3} = \frac{3}{3}$

$y = 1$

$4x + 9(1) = 1$
$4x + 9 = 1$
$-9 \quad -9$

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

$x = -2$

$(-2, 1)$

c) $(-3x + 5y = 7)(2)$ ⟶ $-6x + 10y = 14$
$6x - 10y = -14$ ⟶ $6x - 10y = -14$

$0 = 0$
True

Infinitely Many Solutions
(Lines coincide

d) $(-2x + 4y = 6)(3)$ ⟶ $-6x + 12y = 18$
$(-3x + 6y = 8)(-2)$ ⟶ $6x - 12y = -16$

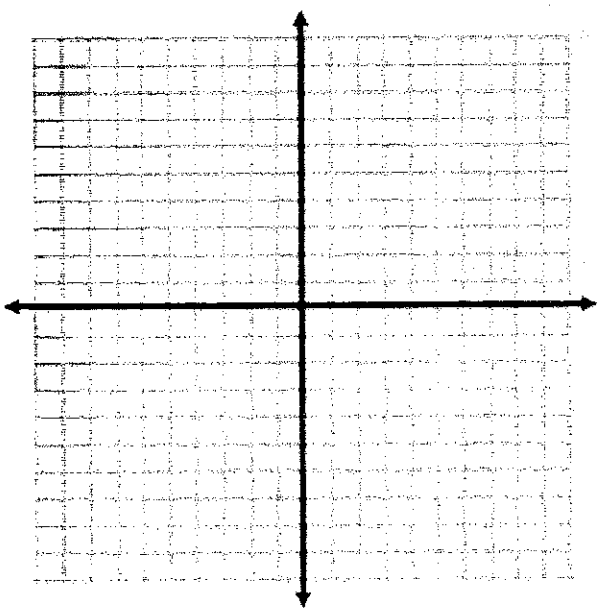
$0 = 2$
False

No Solution
Lines are Parallel

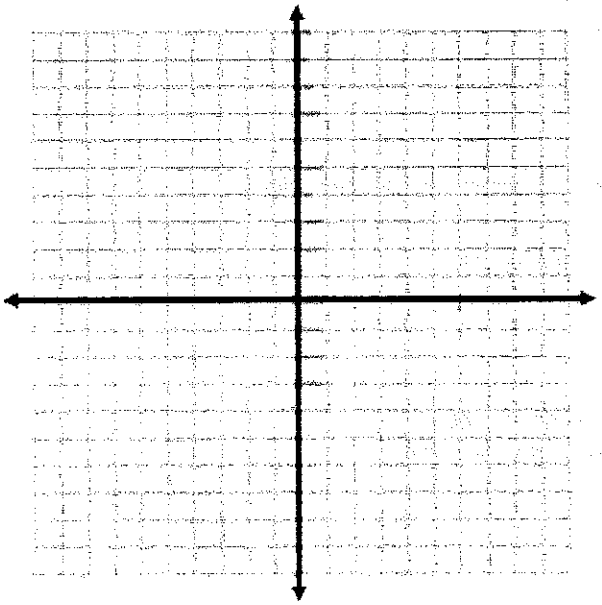
Solving Two-Variable Systems Practice

Solve each system by graphing.

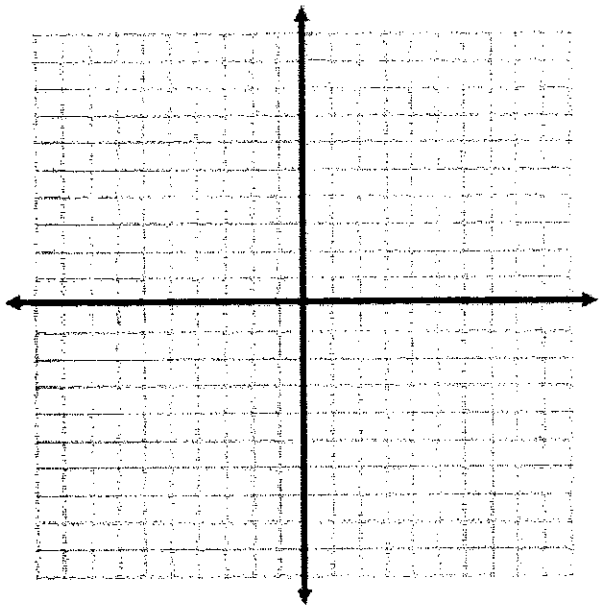
1. $y = 2x + 1$
   $-2x + 3y = -9$



2. $-3x + 4y = 8$
   $x + 2y + 6 = 0$



3. $30x + 50y - 100 = 0$
   $3x - 15y - 30 = 0$



Solve each system by substitution.

4. $y = 2x + 4$
   $-5x - 5y = -5$

5. $2x + y = 7$
   $-2x - y = 6$

6. $4x + 6y = 22$
   $-2x + 4y = 10$

7. $8x - 2y = 8$
   $-4x + y = -4$

Solve each system by elimination.

8. $-x + 4y = 25$
   $3x - y = 13$

9. $-2x - 7y = 22$
   $-7x - 5y = -1$

10. $8x + 4y = 20$
    $-10x - 5y = -25$