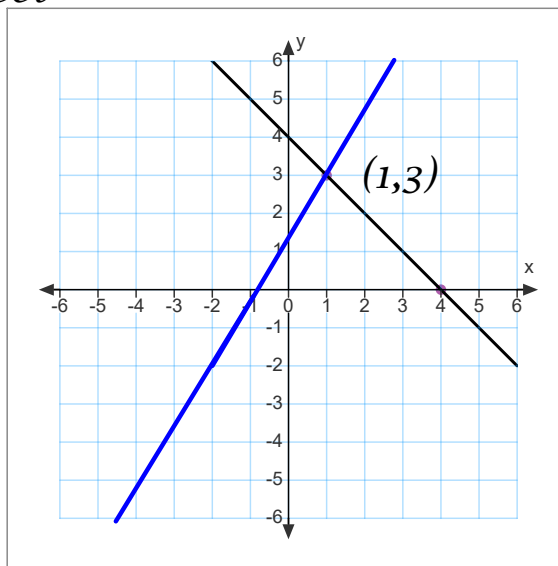


SYSTEMS OF EQUATIONS

Where two lines intersect

Solution: the value of x and y at the point of intersection.

1. Can be found by reading a graph



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2. Can be found by reading a table:

x	y_1	y_2
-2	-3	7
-1	-1	4
0	1	1
1	3	-2
2	5	-5

What are the values of x and y at the same point on each line?

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3. *Can be found algebraically:*

1 - COMPARISON METHOD

2 - SUBSTITUTION METHOD

3 - ELIMINATION METHOD

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COMPARISON METHOD

Used when both equations are in functional form

$$y_1 = y_2$$

ex:

$$y = 2x + 9$$

$$y = -3x - 1$$

Steps:

1. *Equate y_1 to y_2*
2. *Move all your variables to one side, constants to the other*
3. *Solve for x*
4. *Input value of x into one of the equations to solve for y*
5. *Represent solution set (x, y)*

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$y = x - 8$
 $y = -2x + 1$

③ Check:
 $-5 \stackrel{?}{=} -2(3) + 1$
 $= -6 + 1 = -5 \checkmark$

① $x - 8 = -2x + 1$
 $+2x \quad +2x$
 $3x - 8 = 1 \rightarrow 3x = 9$
 $+8 \quad +8$
 $x = 3$

② Plug in:
 $y = 3 - 8$
 $y = -5$

$y = \frac{3}{4}x + \frac{1}{2}$
 $y = \frac{2}{3}x - 1$

① $12 \left(\frac{3}{4}x + \frac{1}{2} = \frac{2}{3}x - 1 \right)$
 $9x + 6 = 8x - 12$
 $-8x \quad -8x$
 $x = -18$

② $y = \frac{2}{3}(-18) - 1$
 $= -12 - 1 = -13$

③ Check:
 $-13 \stackrel{?}{=} \frac{3}{4}(-18) + \frac{1}{2}$
 $= -13.5 + 0.5$
 $= -13 \checkmark$

$y = ax + b$
 (x, y)
 $(3, -5)$
 $(-18, -13)$

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SUBSTITUTION METHOD

Used when one equation is in functional form and the other in general

$$\begin{aligned} y &= ax + b \\ ax + by &= c \end{aligned} \Rightarrow ax + b(ax + b) = c$$

ex:

$$3x + 4y = -6$$

$$y = -2x + 1$$

$$3x + 4(-2x + 1) = -6$$

$$3x - 8x + 4 = -6$$

$$-5x + 4 = -6$$

$$-5x = -10$$

$$x = 2$$

$$y = -2(2) + 1 = -4 + 1 = -3 \quad (2, -3)$$

$$\text{③ Check: } 3(2) + 4(-3) \stackrel{?}{=} -6$$

$$6 - 12 = -6$$

$$-6 = -6 \checkmark$$

Steps:

1. Substitute the isolated variable by the expression representing it into the other equation.

2. Solve for the remaining variable.

3. Input value into original equation and solve.

4. Represent solution set (x, y)

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$2x - 3y = -7$
 $y = 2x - 3$

(1) $2x - 3(2x - 3) = -7$ (2) $y = 2(4) - 3$
 $2x - 6x + 9 = -7$ $= 8 - 3$
 $-4x + 9 = -7$ $= 5$
 $-4x = -16$
 $\frac{-4x}{-4} = \frac{-16}{-4}$
 $x = 4$

$(4, 5)$

$y = 2x - 5$
 $2x - 5y = 9$

(1) $2x - 5(2x - 5) = 9$
 $2x - 10x + 25 = 9$
 $-8x + 25 = 9$
 $-8x = -16$
 $\frac{-8x}{-8} = \frac{-16}{-8}$
 $x = 2$

(2) $y = 2(2) - 5$
 $= 4 - 5 = -1$

$(2, -1)$

$x = 3y + 1$
 $2x - 5y = 3$

$(4, 1)$

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