

SyMan Lesson 4: Solving Systems of Equations, Part 2

In the previous exercise, you used SyMan to algebraically determine the exact point of intersection of two equations. This exercise is similar to the previous one, though the equations are more complicated. You will see that SyMan makes it simple to solve even these problems.

As always, be sure to read the explanation after each step. These explanations tell you why you are doing each step, and give further helpful advice.

This first example involves finding the point of intersection of the lines defined by $-2x + 3y = 4$ and $5x + 8y = -2$.

Step 1 **Enter the equation " $-2x + 3y = 4$ " and rearrange it into the form " $y = \dots$ ". Graph this equation.**

The first step in solving for the intersection point is to isolate one of the variables— in this case, you isolate for 'y' so that you can also graph the equation.

Step 2 **Click on the "remem" button in the upper-left corner of the screen.**

Since you have solved for 'y' in terms of 'x', you can now get ready to substitute it into the other equation.

Step 3 **Enter the equation " $5x + 8y = -2$ " and rearrange it into the form " $y = \dots$ ". Graph this equation.**

You should see the point of intersection of the two graphs on the screen. In order to solve algebraically for the intersection, you do not have to rearrange the equation yet, but it is necessary to put it into " $y = \dots$ " form to graph it.

Step 4 **Click on the "y" substitution button to substitute the equation from steps 1-2.**

In step 1, you found 'y' expressed in terms of 'x'; now you substitute that into the current equation. The active equation should become $f(4 + 2x, 3) = f(-2 - 5x, 8)$.

Step 5 **Multiply by the each of the numbers in the denominators, and simplify the result.**

You should end up with the equation $8(2x + 4) = 3(-5x - 2)$.

Step 6 **Expand the active equation by clicking on the "expand" button in the upper-left corner of the screen, and simplify the result.**

SyMan does not automatically expand expressions like " $8(2x + 4)$ "— you have to tell SyMan to expand them. In this case, you should end up with " $16x + 32 = -15x - 6$ " after you simplify.

Step 7 **Solve the active equation for 'x' and write down this result in the space below. The answer may not be an integer!**

x = _____

Step 8 **Tell SyMan to "remem" this result.**

Step 9 Re-enter the first equation " $-2x + 3y = 4$ " and tell SyMan to substitute the result from Steps 7 and 8. (click on the "x" button in the upper-left corner)

Step 10 Solve the active equation for 'y', and, using the x-value from Step 7, write down the final result below. (It may not be an integer!)

algebraically-determined intersection point is (_____ , _____)

Step 11 To determine the decimal-value equivalent of a fraction, enter the fraction and choose the "Evaluate" option from the Simplify menu. For example, to determine the decimal equivalent of $\frac{2}{3}$, enter "2/3" and choose "Evaluate" from the Simplify menu.

Use this method to determine the decimal equivalents of the x-value and y-value you found in Step 10, and write them below:

decimal intersection point is (_____ , _____)

Step 12 Using the graph and the mouse-crosshair coordinates, find the approximate intersection point and write your result below. You may wish to zoom-in for better accuracy.

from graph, intersection point is (_____ , _____)

Step 12 Compare the results in Step 11 to the results of Step 12. The two answers should be nearly identical if your work is correct.

When you have completed Steps 1 through 12, go on to answer the following questions:

1.) Use SyMan to solve for the intersection points of the following pairs of lines; write the point of intersection in the space provided. Not all questions have integer solutions!

a) $3y+3 = x-95$ and $-y-3 = 12x-69$ (_____ , _____)

b) $4y+4 = 12x+8$ and $-6y+6 = 11x-58$ (_____ , _____)

c) $-4y-10 = -11x-177$ and $-7y+7 = x-103$ (_____ , _____)

d) $-8y-15 = -9x-63$ and $-9y-10 = -9x-73$ (_____ , _____)

e) $5y-8 = 4x+27$ and $-8y-14 = -8x-86$ (_____ , _____)

f) $-3y+1 = 5x+7$ and $7y-4 = 8x+50$ (_____ , _____)

g) $6y+10 = -5x+4$ and $-15y-2 = -8x+25$ (_____ , _____)

h) $8y+12 = 10x-8$ and $21y-3 = 6x+40$ (_____ , _____)