# Systems of Equations (4.1 & 4.3)
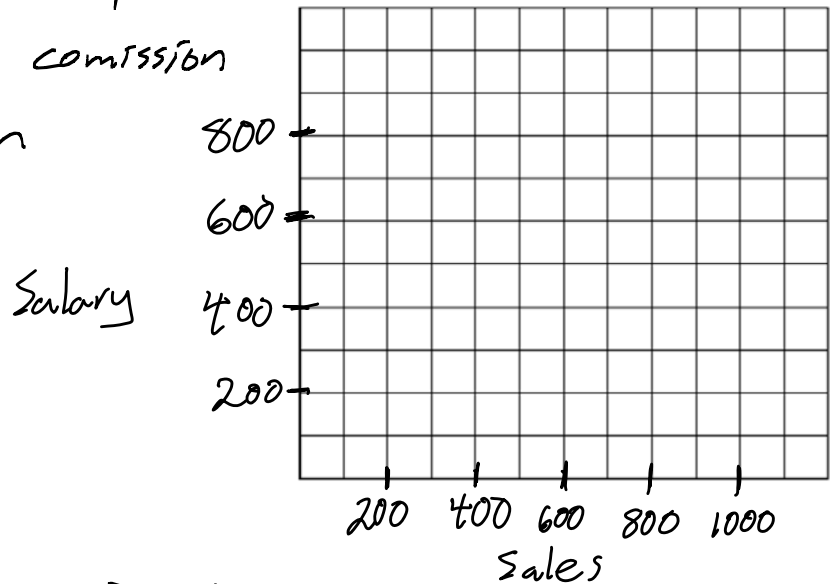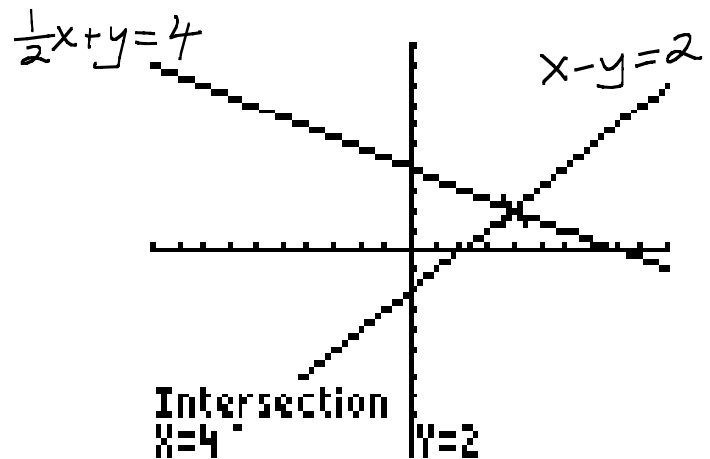
① Back to the comission example we've been using, how much in sales would you need to make for the following comission plans to be even.

- \$200 salary with 25% comission
- no salary, 50% comission



(Salary axis: 200, 400, 600, 800; Sales axis: 200, 400, 600, 800, 1000)

③ Given the following graph, find the solution to the system of equations

$$\begin{cases} x-y=2 \\ \frac{1}{2}x+y=4 \end{cases}$$



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

Intersection
X=4   Y=2

④ Solve the system by graphing

$$\begin{cases} 2x+3y=6 \\ 3x+y=-5 \end{cases}$$

**5.** Suppose a person is interested in starting up a small espresso stand and wants to estimate how much work it will take to make a profit. After doing a bit of research, she learns that it will cost about $290 a month for permits plus roughly $0.61 per cup for ingredients and employee salary. If the selling price averages $2.80 a cup, how many cups of coffee must our entrepreneur sell to break even? Solve this by graphing the cost function and revenue function on the graphing calculator.
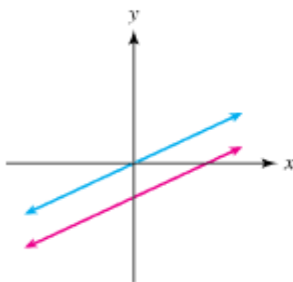
**6.** Approximate the solutions to the following systems by graphing.

$$\begin{cases} y = \dfrac{3}{5}x + 4 \\ y = -2x - 9 \end{cases}$$
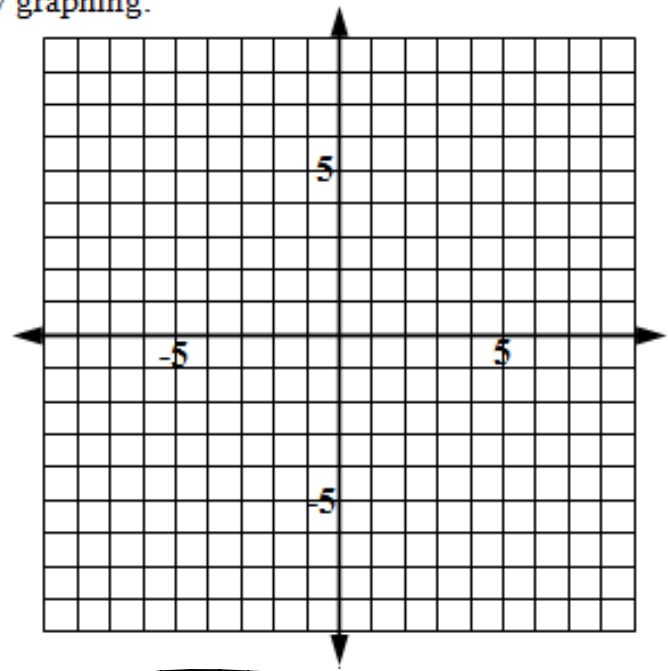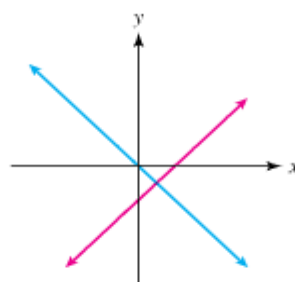
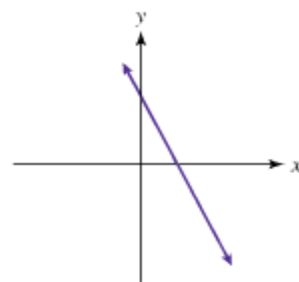There are 3 cases for solutions to systems of equations

(a)

(b)

(c)

# Solving systems of equations by Elimination

If $a=b$ and $c=d$, then

We can add two equations to "eliminate" one of the variables.

- First, multiply the equations to make one set of variables have opposite coeffircients.
- Second, add the equations to "eliminate" the variable with opposite coeffircients.
- Lastly, solve for the last variable by plugging in the solved one into either original equation

① Solve the system by elimination

a) $\begin{cases} 2x + y = 8 \\ 3x - y = 2 \end{cases}$

b) $\begin{cases} 3u + 2v = -16 \\ 2u + v = -9 \end{cases}$

② Solve the system of equations by elimination.

a) $\begin{cases} -2x+7y=7 \\ 6x+2y=-16 \end{cases}$

b) $\begin{cases} 3x-12y=-6 \\ 8x+5y=1 \end{cases}$

c) $\begin{cases} \dfrac{5}{6}x-\dfrac{1}{3}y=2 \\ 3x+4y=-8 \end{cases}$

③ You decide to run a kettle corn stand during the summer. You sell small bags for $3 and large bags for $5. He can easily count the total number of bags sold as sell as how much he earned that day. On one Saturday, he made $881 on the sale of 209 bags of popcorn. How many of each type of bag did he sell?

④ A pottery studio gives 3-hour and 4-hour classes for $46 an hour. If the studio collected $6394 for a total of 39 classes, how many of each type of class were paid for?

⑤ A somewhat surprising fact is that you can determine the speed of a river by traveling at a steady pace upstream and downstream and keeping track of your distance and time. Suppose you and a friend canoe to a campsite 12 miles up a river in 2 hours and 24 minutes (or $2\frac{2}{5}$ hours). The next day it takes you 1 hour and 20 minutes (or $1\frac{1}{3}$ hours) to return. What was the speed of the river's current, and what was your boat's speed if the water had been still?