Name:____ Band:_________

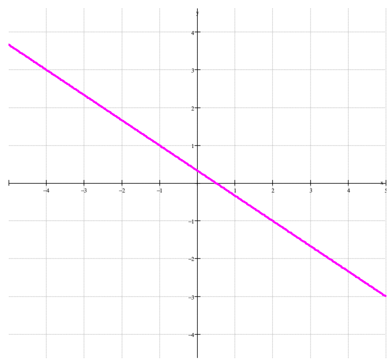
Algebra II | Packer Collegiate Institute | 2008-2009

Systems of Inequalities: Linear and Linear-Quadratic

REVIEW: SYSTEMS OF LINEAR EQUATIONS

The solution to the equation $2x+3y=1$ is the set of *all* points (x,y) which satisfy the equation. So, for example, the point $(-1,1)$ is a solution to the equation, while the point $(2,2)$ is not. (Can you explain why?)

All the (x,y) points that satisfy the equation are:

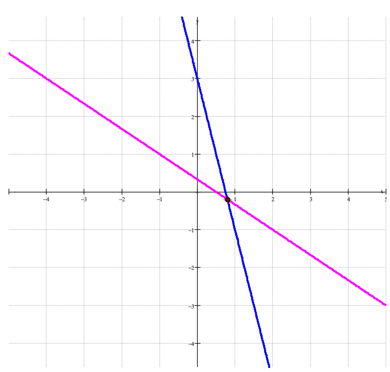


Yes, the solution is the line!

A system of equations is the solution of when two equations are solved *simultaneously*. So, for example, when you see: $\begin{cases} 2x+3y=1 \\ 4x+y=3 \end{cases}$, you know this is asking:

"what (x,y) point(s) make *both* equations true?"

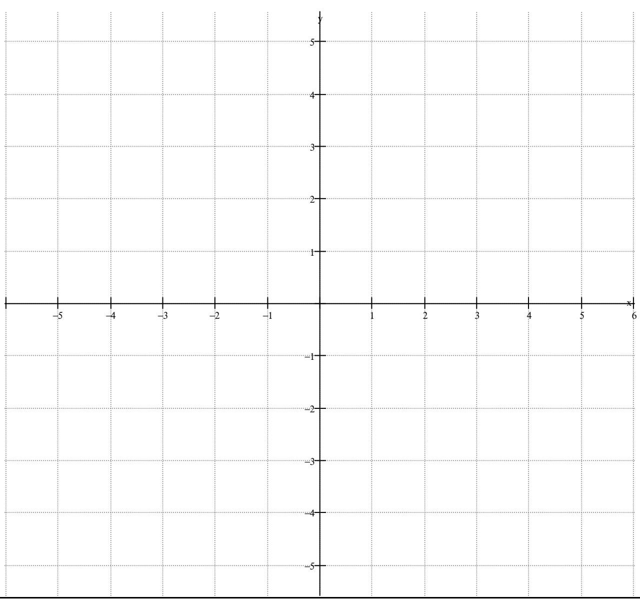
Of course graphically, we know that all points on the line $2x+3y=1$ satisfy the first equation, and we know that all points on the line $4x+y=3$ satisfy the second equation. So the *intersection* gives the (x,y) point which satisfies both equations.



As of now, we've learned to find the intersection point by (a) graphing, (b) elimination, and (c) substitution. Check yo'self!

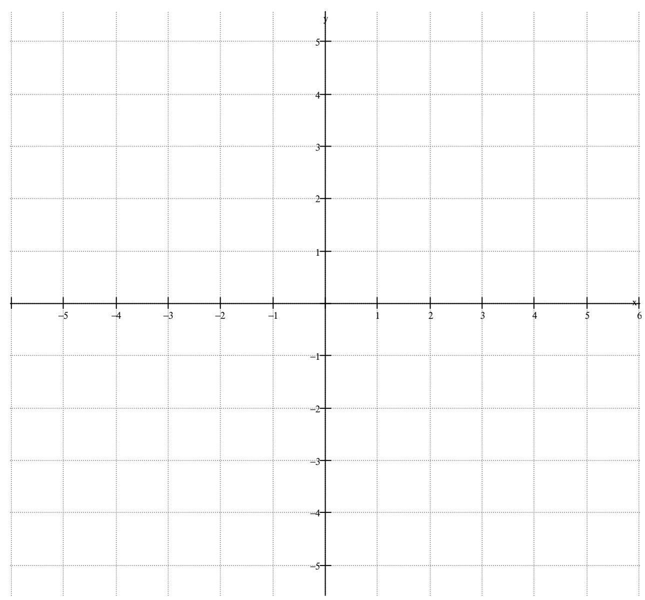
Solve the system of equations by elimination or substitution. Graph both equations on the axes below to check your answer.

$$\begin{cases} y = \dfrac{5}{2}x + 2 \\ y = \dfrac{1}{2}x - 2 \end{cases}$$



Solve the system of equations by elimination or substitution.

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

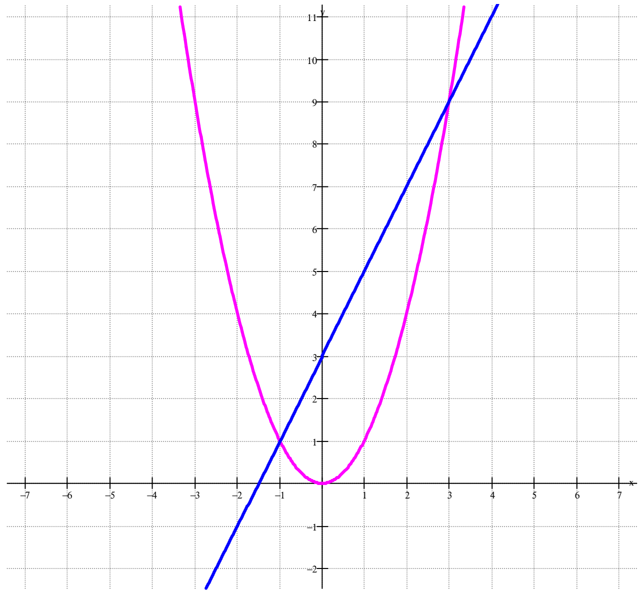


QUADRATIC-LINEAR SYSTEMS

What if you have a system of equations like $\begin{cases} y = 2x + 3 \\ y = x^2 \end{cases}$? We want to find all (x, y) points which satisfy both equations. Without graphing, we use *substitution* to get:

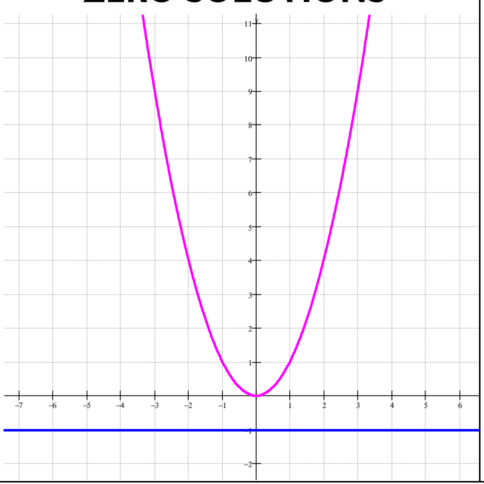
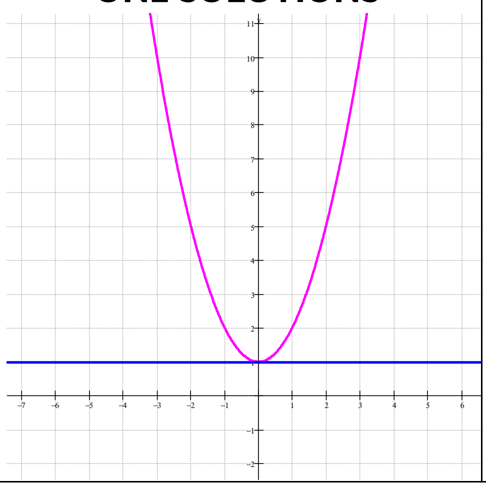
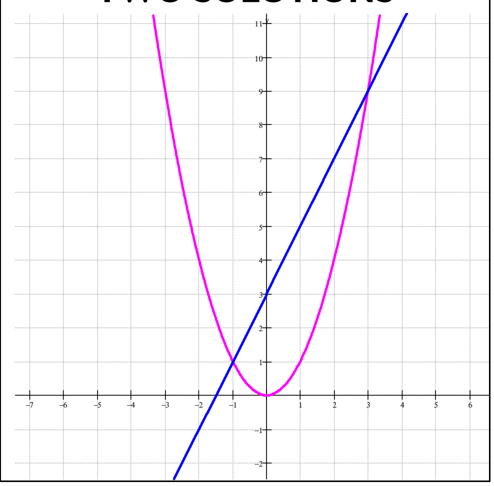
$$2x + 3 = x^2$$
$$0 = x^2 - 2x - 3$$
$$0 = (x-3)(x+1)$$
$$x = 3 \text{ and } x = -1$$

Since we know $x = 3$ and $x = -1$, we know that the points of intersection are: $(3,9)$ and $(-1,1)$
Let's graph it to see if these are the intersection points!



It works! Huzzah!

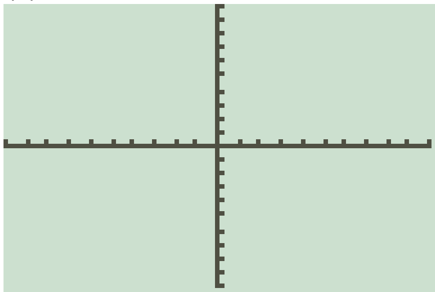
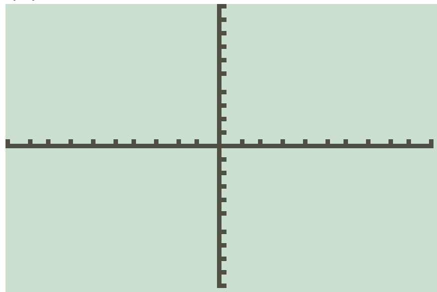
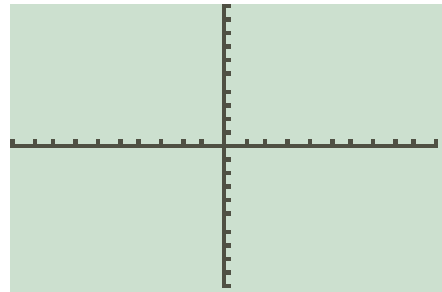
Sometimes you'll have 0 solutions, 1 solutions, or 2 solutions.

ZERO SOLUTIONS	ONE SOLUTIONS	TWO SOLUTIONS
		

Check yo'sefl! Solve each quadratic-linear system algebraically.

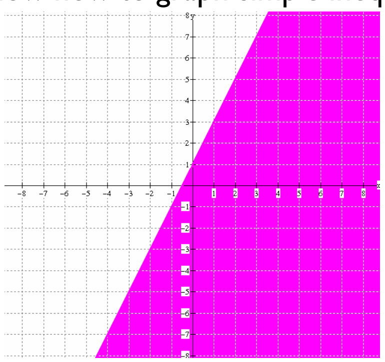
(1) $\begin{cases} 2x + y = 10 \\ y = 9 - x^2 \end{cases}$	(2) $\begin{cases} x + y = -6 \\ y = x^2 + 6x \end{cases}$	(3) $\begin{cases} y = x + 3 \\ y = 4x - x^2 \end{cases}$

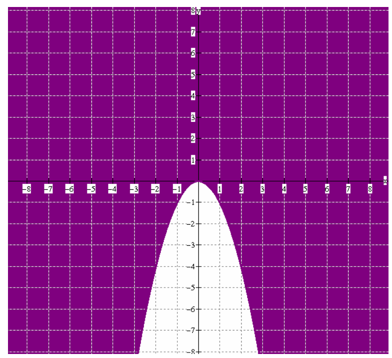
Graph on your graphing calculators the quadratic-linear system and sketch what appears below. Use your standard window of [-10,10]x[-10,10].

(1) 	(2) 	(3) 

SYSTEMS OF LINEAR INEQUALITIES

Up to this point, you know how to graph simple inequalities like





Today we're going to graph *systems of inequalities.*

Step 1: If necessary, put each inequality in slope-intercept form. Reminder: If you multiply or divide by a negative number you have to change the sign!

Step 2: Graph each inequality.

- If the inequality sign is ≥ or ≤ use a solid line to connect your points.
- If the inequality sign is > or < use a dashed line to connect your points.
- Label your point(s) of intersection (if there are any)

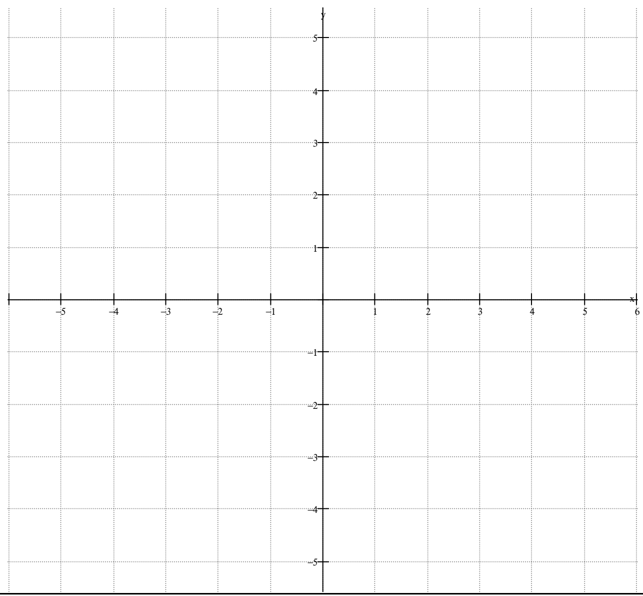
Step 3: Shade the solution set for each individual inequality.

- **The solution to the system of inequalities is the doubly shaded region.**

Step 4: Check your solution set.

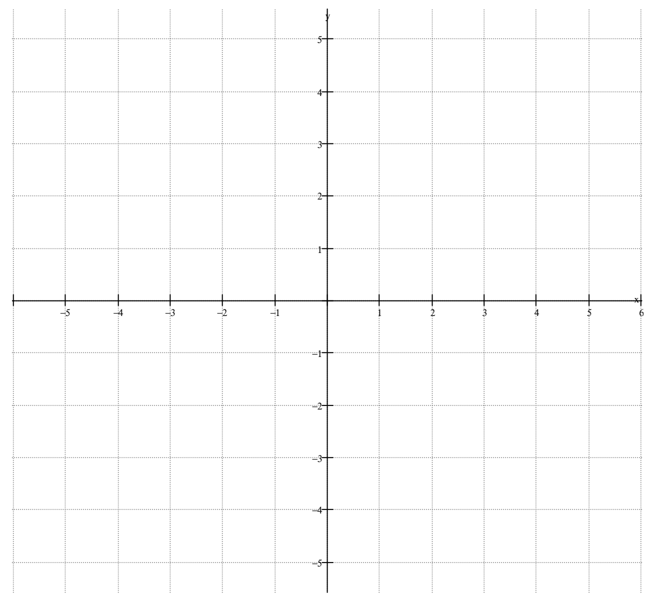
Graph the solution set to the system of inequalities on the axes below to check your answer.

$$\begin{cases} y \le \dfrac{5}{2}x + 2 \\ y \ge \dfrac{1}{2}x - 2 \end{cases}$$



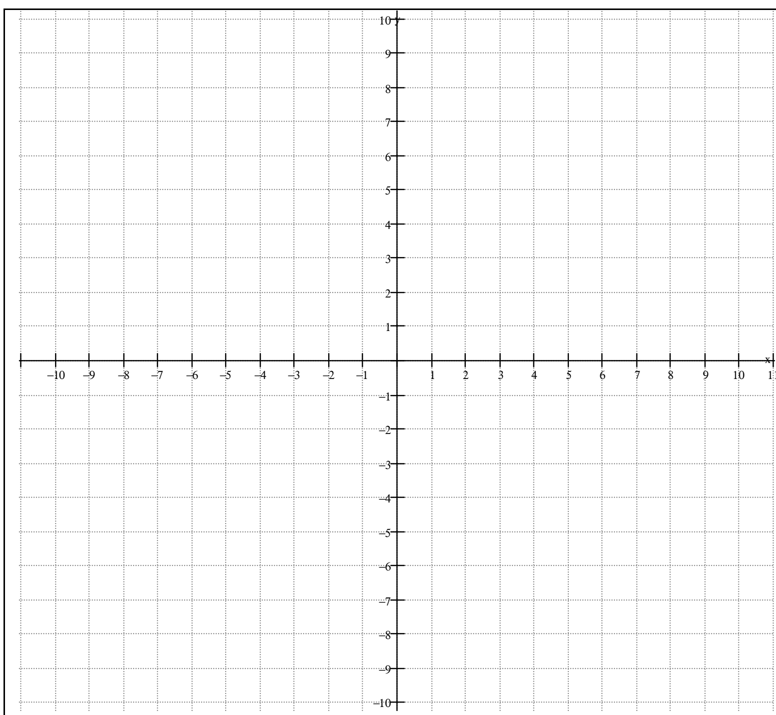
Graph the solution set to the system of inequalities on the axes below to check your answer.

$$\begin{cases} x + y < -3 \\ 5x - y \le -3 \end{cases}$$

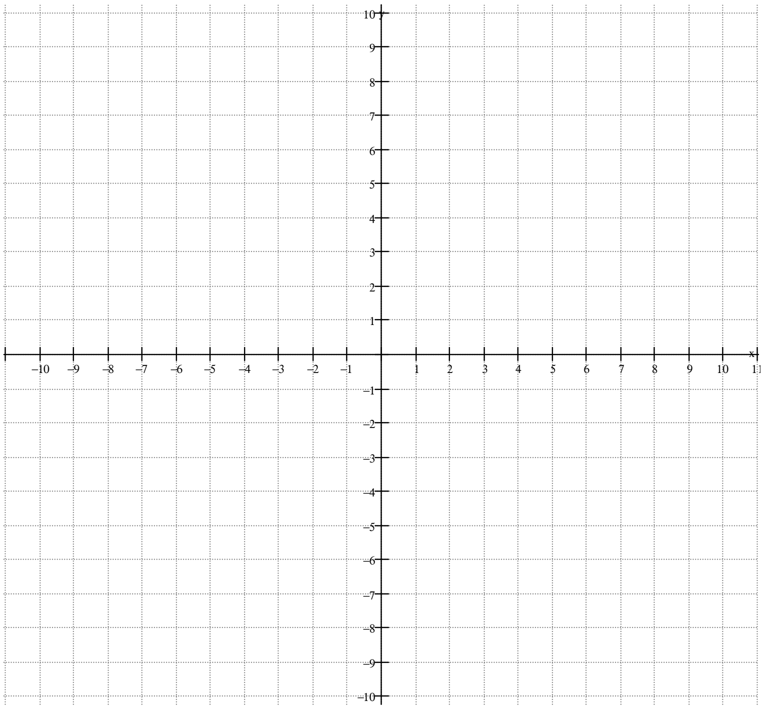
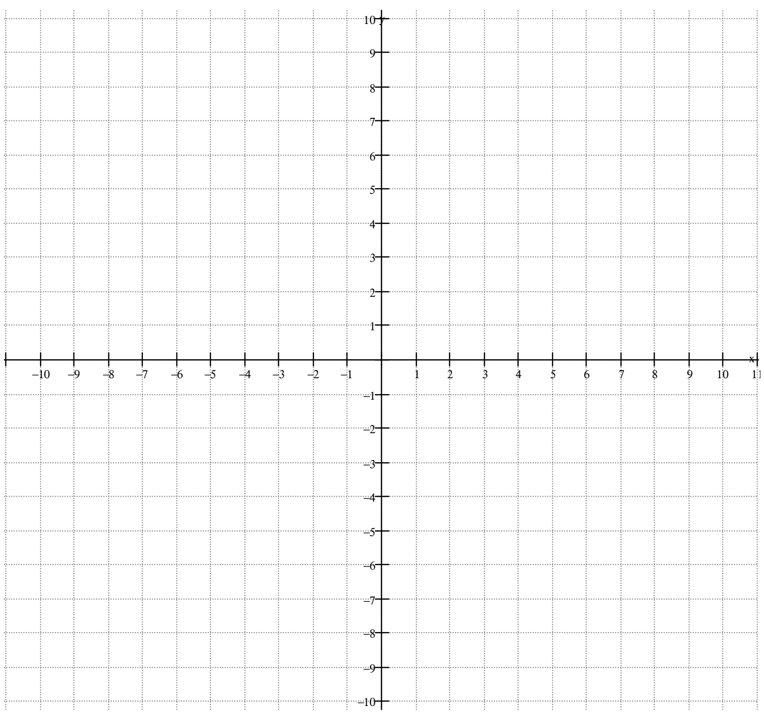


SYSTEMS OF LINEAR-QUADRATIC INEQUALITIES

You solve these in exactly the same way that you solved linear inequalities. The only difference is that there will be one line and one parabola in on your graphs!



(4) $\begin{cases} 2x + y > 10 \\ y < 9 - x^2 \end{cases}$

	(5) $\begin{cases} x + y \le -6 \\ y < x^2 + 6x \end{cases}$
	(6) $\begin{cases} y \ge x + 3 \\ y > 4x - x^2 \end{cases}$