Graphing and Sets

You can think of the number line representation you use when solving inequalities as a grapical/visual representation of a one-dimensional solution set. Likewise, the usual graphing of equations with two variables can be thought of as graphical/visual representation of a two-dimensional solution set. To strengthen this connection, we will try to graphically represent both generic sets and solution sets. The point being that you can think of a graph as a collection of points that have something in common - often, that common property can be described in terms of solution sets.

1. Represent the solution set of $|x| = 3$ on a number line. Now graphically represent the solution set to $|x| = 3$ in the plane. What similarities do you see?

2. Represent on the number line the set of all points that are 3 units away from the origin. Now represent in the plane the set of all points that are 3 units away from the origin (it might help to think geometrically). Do you see any similarities?

3. Represent on a number line the set of all numbers that can be written as a fraction with 1 in the numerator and a positive integer in the denominator. (We could also use set notation to describe this set: $\{x \ : \ x = \frac{1}{n}$ where n is a positive integer$\}$.)

4. Represent the set of all points in the plane such that the product of the x-coordinate and the y-coordinate is positive. (That is, represent $\{(x, y) \ : \ xy > 0\}$.)

5. (a) Represent in the plane the solution set to the equation $y = 2x - 1$.
   (b) How is this process the same or different from "graphing the line $y = 2x - 1$"?

6. (a) Suppose you know that the point $(\frac{2}{5}, 9)$ is on the (complicated) graph of $y = 15x^3 - 6x^2 + 5x + 7$. What does this tell you about the relationship between $\frac{2}{5}$ and 9?
   (b) Suppose you are talking about some function $f(x)$, and all you know is that the graph of $y = f(x)$ intersects the point $(3, -4)$. What can you say about $f(3)$? How about $f(-4)$?

7. Given two points in the plane A and B, represent the set of all points that are equidistant from A and B. (Note that this set contains more than just one point...) This set of points is a common construction in geometry - can you name it?