Problem 0. Solve the following inequality. (1 point)

$$|3x| < 9$$

Solution. $|3x| < 9$ means $3x < 9$ and $-9 < 3x$. Therefore, we have $x < 3$ and $-3 < x$, whence

$$-3 < x < 3.$$

Problem 1. Let $A(a, b)$ be a point on the Cartesian plane, and r a positive real number. If $B(x, y)$ is any point on the Cartesian plane such that the distance $d(A, B)$ is r, then what is the formula that describes the relation between $A(a, b)$ and $B(x, y)$? (Hint: you already know this formula.) (2 point)

Solution. It's the distance formula:

$$r = \sqrt{(x-a)^2 + (y-b)^2}$$

Problem 2. Let C be the collection of all such points (x, y) in Problem 1. What does C look like? (2 point)

Solution. You have a point. You have a bunch of points which are exactly the same distance away from that point. You have—a circle. (This is how you draw a circle with a compass.)

Alternatively, the formula in Problem 1

$$r = \sqrt{(x-a)^2 + (y-b)^2}$$

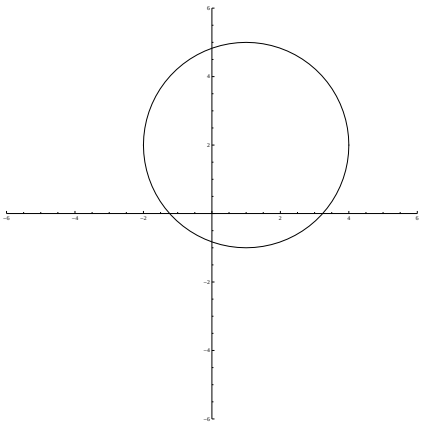
looks strangely similar to the equation of a circle

$$r^2 = (x-a)^2 + (y-b)^2$$

Problem 3. Now, let $a = 1$, $b = 2$, and $r = 3$. Graph C with the given values. (2 points)

Solution. We plot the graph of a circle

$$3^2 = (x-1)^2 + (y-2)^2.$$



Problem 4. Let $\overline{C}$ be the collection of points $(-x, y)$, where (x, y) is a point in C. For example, if $(x, y) = (15, 2)$, then $(-x, y) = (-15, 2)$. Now, graph $\overline{C}$ with the values of a, b, and r given in Problem 1. (3 points)

Solution. Sending x to $-x$ represents the symmetry with respect to the y-axis. Therefore, $\overline{C}$ is the circle of radius 3 with the center $(-1, 2)$. Hence, we graph

$$3^2 = (x+1)^2 + (y-2)^2.$$