Purpose: In this problem set, you will explore the properties of absolute value functions. In particular, you will practice solving absolute value equations and inequalities.

Definition: The **absolute value function** can be defined as

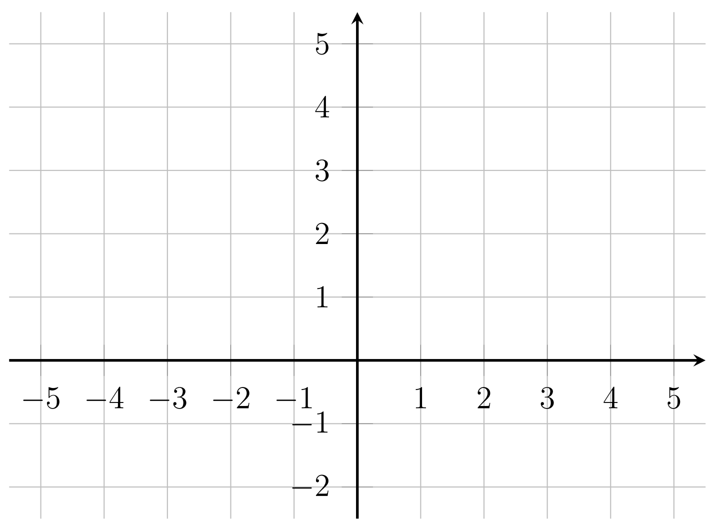
$$f(x) = |x| = \begin{cases} \quad\quad\quad & \text{if } x > 0 \\ \quad\quad\quad & \text{if } x < 0. \end{cases}$$

Generally, we want to interpret the absolute value as a distance. The absolute value $|a - b|$ give the distance between a and b on a number line without needing to know which is larger to start with.

1. Use an absolute value inequality to describe all numbers within a distance of 3 from 2.

2. Goal: Solve the absolute value inequality $3 \geq |x + 1|$.

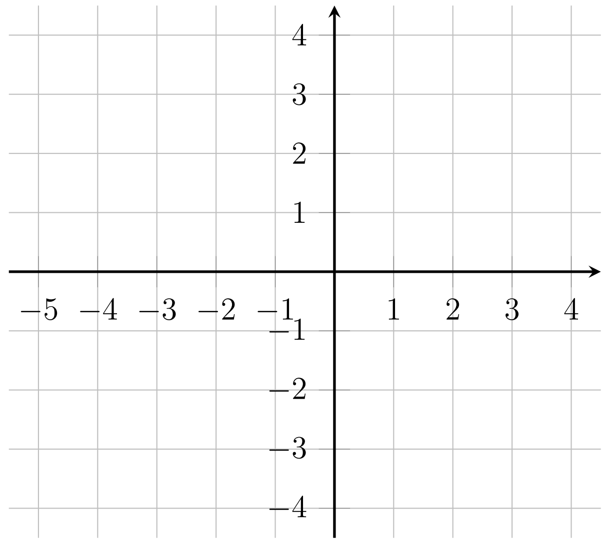
   (a) Sketch a graph that might help you. Guess the solution set. Write down the guesses from everyone in your group. Check with Sarah before proceeding.



   (b) Follow-up with the algebra to confirm or deny your guess. Does your group agree?

3. Goal: Solve $2 > |x| - 4$.

   (a) Sketch a graph that might help you. Guess the solution set. Write down the guesses from everyone in your group. Check with Sarah before proceeding.



   (b) Follow-up with the algebra to confirm or deny your guess. Does your group agree?

4. Goal: Solve $15 < 3\,|2x - 1|$.

   (a) What's your group's plan to solve this absolute value inequality? Check in with Sarah.

   (b) Solve it!

5. **Reflection Questions:**

(a) When will your solution to an absolute value inequality be two separate intervals? (You may want to draw a picture.)

(b) When will your solution be a single interval? (You may want to draw a picture.)

(c) Suppose your friend (who DESPISES graphing) is trying to solve $3 \geq |x+1|$ which you solved in question 2. They've done this so far:

i. First, they solved $|x+1| = 3$, which gave them $x = -4$ and $x = 2$.

ii. Computed $|-5+1| = 4$, and decided all $x < -4$ aren't solutions.

Do you think they have a reasonable strategy and made a good conclusion? What should your friend do next?

(d) Solve $4 < \frac{1}{3}|x+2|$

(e) Solve $0 < 3|2-x|$.