136 Homework #1

Due: **Thursday, September 24**

This homework is in addition to the regularly assigned 171 weekly homework. Feel free to use your notes or book, and you also may work together so long as you write up your solutions on your own.

1. Evaluate the following reasoning:

   Suppose that $x = 1$ and $y = 1$. Then we have

   $$\begin{aligned} xy &= y^2 \\ -xy &= -y^2 \\ x^2 - xy &= x^2 - y^2 \\ x(x-y) &= (x+y)(x-y) \\ x &= x+y \\ 1 &= 2 \end{aligned}$$

   So 1 must equal 2.

2. Give a detailed (at least a paragraph) explanation of why you "flip" the inequality sign when you multiply both sides of an inequality by a negative number. Feel free to include diagrams or pictures, and remember that an example by itself is not an explanation. Don't convince me you know the rule, convince me that you can explain why the rule is necessary to other people.

3. (a) Evaluate the following reasoning:

   I am supposed to show that $1 = -1$. Here's what I did.

   $$\begin{aligned} 1 &= -1 \\ (1)^2 &= (-1)^2 \\ 1 &= 1 \end{aligned}$$

   I squared both sides, and I got a statement that is always true. So the statement $1 = -1$ must always be true.

(b) Evaluate the student's *algebra* in problem 7(b) from the Solution Sets worksheet. That is, if the algebra is incorrect, explain what they did and why it was inappropriate. If the algebra is correct, explain what they did at each step.

(c) Now evaluate the student's *reasoning* in problem 7(b) from the Solution Sets worksheet. That is, if they drew a faulty conclusion, why was it faulty? If their reasoning is valid, is there a clearer, more logical way to go about solving the problem? (Hint: Compare to question 3a above.)

4. Solve $|x+4| < 3$ both entirely algebraically and entirely graphically/geometrically. Also give at least three different English sentences involving ideas of distance that mean the same thing as the *given* inequality (not the solved version). (See #2 on the Absolute Value worksheet for hints).

5. Solve $|x|+|x-3| = 5$ both entirely algebraically and entirely graphically/geometrically. (Hint: you might want to think about cases.)