Worksheet #4 - Completing the Square

In this worksheet, you will use a technique called **completing the square** to solve quadratic equations.

1. Solve the following equations by moving all the terms to one side and factoring:

   \[ x^2 + 2x = -1. \]

2. If you try to solve the equation in problem 1 by factoring the left side first, it doesn’t get you anywhere. Explain why.
3. Solve the following equation by adding 1 to both sides and then factoring the left side. (You’ll eventually need to take square roots.)

\[ x^2 + 2x = 3. \]

4. Solve the following equation by adding 1 to both sides and then factoring the left side.

\[ x^2 + 2x = 11. \]
5. Solve the following equation by adding 4 to both sides and then factoring the left side.

\[ x^2 + 4x = 9 \]

6. Explain why adding 4 to both sides of the equation helped you to solve the equation in the previous question.

6. Solve the following equation by adding an appropriate number to both sides and then factoring the left side as a perfect square.

\[ x^2 + 6x = 1. \]
8. Solve the following equation by adding an appropriate number to both sides and then factoring the left side as a perfect square.

\[ x^2 + 8x = 1. \]

9. Solve the following equation by adding an appropriate number to both sides and then factoring the left side as a perfect square.

\[ x^2 + 10x = 1. \]
Solve the following equation by adding an appropriate number to both sides and then factoring the left side as a perfect square.

\[ x^2 + bx = 1. \]

(Hint: The b in this equation is some constant – we don’t know what it is (maybe it’s 4, maybe it’s 6, maybe it’s something else). You have to decide what to add to both sides of the equation, and that quantity will depend on b, so you’ll have to use an expression that has b in it. You won’t really know what the number is that you’re adding, because you don’t know what b is. Think about what you did in the last few questions and how you decided what to add to those equations.)