**Mathematical Systems**

**Zero Product Property**

If \( AB = 0 \), then \( A = 0 \), or \( B = 0 \), or \( A \) and \( B \) equal zero.

An application of the Zero Product Property will allow us to solve higher degree equations by changing them into multiplication problems whose product is zero.

For example, if I were asked to solve, \( x^2 - x = 12 \). I might have a little trouble. If I changed the problem into a multiplication problem (factoring), I would have

\[
x(x - 1) = 12
\]

I have two numbers multiplied together that equal 12. Through a trial and error process, I might find values of \( x \) that would satisfy the original equation. But, if I used the Zero Product Property, I would be able to solve the problem using the logic we used in third grade – the product is zero if I multiplied by zero.

Rewriting \( x^2 - x = 12 \) to \( x^2 - x - 12 = 0 \), then factoring, I would have the product of two numbers equaling zero rather than 12. By using the third grade logic, I know that one of the two numbers or maybe both of them are zero since the product is zero.

In other words, we would have \( (x - 4)(x + 3) = 0 \).

When is \( x - 4 = 0? \) When is the other number \( x + 3 = 0? \)

When you answer those questions, you have found the values of \( x \) that make the open sentence true. Simply put, you solved the equation.

The answer, the solution, the zeros are \( x = 4 \) or \( x = -3 \).