SOLVING EQUATIONS (General Information)

Anytime you see the word SOLVE, keep in mind that you are searching for the value of the indicated unknown. (Or the value of it relative to the other variables in the equation.)

If you are Solving for x, for example: Then x must be *isolated* on one side of the equation and all other terms and factors must be correctly "maneuvered" to the other side of the equation through correct algebraic manipulation.
When completed: There should be no "x's" on the "other side" of the equation. (If there were, you would not have solved for x - It would be like giving a definition of "table" and using the word "table" in your definition - it's worthless.)

As we go through the semester: We will find *new methods* to solve equations - each time, the method will bring us *back* to a *simpler*, more *familiar* equation that we should already know how to solve. Thus, it is very important to look for PATTERNS or TYPES of equations so that you will know the most efficient method to apply as you see them.

Steps in Solving: When solving equations, each step should be an equation that is "*equivalent*" to the previous equation. (*See Exceptions Below*) This may sound like double talk, but for two equations to be equivalent, they must have the same solution(s). The solution "is the value of the unknown that makes the given equation a true statement." (For example: If $x + 5 = 12$, then $x = 7$ is the *solution* or *root* because $7 + 5 = 12$ is true). There are theorems or rules that tell us that we can: "add, subtract, multiply, divide" both sides of an equation by the same number (as long as we don't multiply or divide by 0), and the resulting equation will be "equivalent" to the previous one. These basic "algebraic maneuvers" allow us to solve all linear (1^{st} degree) equations and some rational (fraction) equations.

Non-linear Equations & the Multiplicative Property of *Zero*: Remember if you have an equation that is "non-linear", that is it is of degree greater than *one*, you should do the following:
First: Set the Equation Equal to 0.
Second: FACTOR.
Third: Set Each Factor Equal to 0. This last step, enabling us to solve only *simple linear* equations is possible because of the Multiplicative Property of *Zero* which says that the *ONLY* way that product of factors could be *zero* is that one of them *has* to equal 0.

Exceptions: These will be discussed later in the semester; but this is the basic idea: As the equation is stated, it can *not* be solved by the means that we have of keeping equations equivalent. We have to employ a method that *keeps* all of the original solutions, but it *may* also introduce *more* solutions. That is, as we are going through our steps, instead of every equation being *equivalent* (having the *same* solutions), we produce a step that has an equation that *could* have *extra* or *extraneous* solutions. Obviously, it is good that we did *not lose* any solutions or this would have been a very poor method. The extra work caused by the *possibility* of extra solutions is that we will be *required* to CHECK our ANSWERS!