Math 108 Week 8 **Addition to notes in text on 10.6**

There are extra problems in the homework for week 8 that provide practice on this material. At least one question in the homework quiz will be on this material and there will be a question on the test on this material.

On page 706 in your text, example 3 demonstrates the algebraic process of squaring both sides of an equation when a radical appears in the equation. Another sample of this is on page 707 in example 4. Note that in both of those exercises, the radical is already isolated and the binomial is already on the other side of the equation. Algebraically, that may not be the way the original equation appears. But, it is the necessary starting point to "square both sides" of the equation.

Solve: $\sqrt{x+7}+5=x$

The radical needs to be isolated prior to squaring both sides of the equation.
Rewrite the original equation as: $\sqrt{x+7}=x-5$

Now square both sides: $(\sqrt{x+7})^2=(x-5)^2$

$$x + 7 = x^2 - 10x + 25$$

To solve a quadratic equation you need all the terms on one side and zero on the other.

$$x^2 - 11x + 18 = 0$$

Now, factor and use the zero-factor property to solve the quadratic.

$$(x - 9)(x - 2) = 0$$
$$x = 9, 2$$

These are possible solutions for the original equation, we won't know if either is a solution until we check in the original equation. (Extraneous roots are possible when squaring both sides. By squaring, we lose the uniqueness of signs.)

Check $x = 9$	Check $x = 2$
$\sqrt{9+7}+\ 5=9$	$\sqrt{2+7}+5=2$
$\sqrt{16}+5=9$	$\sqrt{9}+5=2$
$4 + 5 = 9$	$3 + 5 = 2$
$9 = 9$	$8 = 2$
True	False

So, the solution of $\sqrt{x+7}+5=x$ is $x = 9$.

It is important to isolate a radical term before using the principal of powers.
Suppose both sides of the equation were squared *before* isolating the radical.
On the left side of the equation we would have had the expression $(\sqrt{x+7}+5)^2$ which becomes $x+7+10\sqrt{x+7}+25$. A radical would have remained in the equation and we would have been no closer to solving the original equation.