4.4: Solving by using the Quadratic Formula

The last algebraic method we will use to solve quadratic equations is using the quadratic formula. It is used when the quadratic is in standard form meaning: ax^2+bx+c.

YOU NEED TO MEMORIZE THIS!!	$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$	Sung to tune of "Pop Goes the Weasel"

For the problems that we've done so far, when have you been able to tell if you'll have rational, irrational, or imaginary solutions?

When you find the number under the square root

Discriminant: Number under the square root

1. *Solve each equation using the quadratic formula*

a) $x^2+x-110=0$

$a=1 \quad b=1 \quad c=-110$

$x=\frac{-1\pm\sqrt{(1)^2-4(1)(-110)}}{2(1)}$

$=\frac{-1\pm\sqrt{1+440}}{2}=\frac{-1\pm\sqrt{441}}{2}$

$=\frac{-1\pm21}{2}$ $\quad \frac{-1+21}{2}=\frac{20}{2}=\boxed{10}$ $\quad \frac{-1-21}{2}=\frac{-22}{2}=\boxed{-11}$

b) $x^2+11x+18=0$

$a=1 \quad b=11 \quad c=18$

$x=\frac{-11\pm\sqrt{(11)^2-4(1)(18)}}{2(1)}$

$=\frac{-11\pm\sqrt{121-72}}{2}=\frac{-11\pm\sqrt{49}}{2}$

$=\frac{-11\pm7}{2}$ $\quad \frac{-11+7}{2}=\frac{-4}{2}=\boxed{-2}$ $\quad \frac{-11-7}{2}=\frac{-18}{2}=\boxed{-9}$

A lot of the time the struggle can be knowing the order of what to simplify. Here is something that might help you if you choose to use it:

Identify a, b, c
Plug in
Discriminant/denominator
Radical
Reduce
Split & solve

Are you ready to use quadratic formula?"
I'm Pretty Darn Ready
Rico Suave

d) $4x^2+10x+6=0$

e) $x^2 - 4x + 10 = 0$

$a=1 \quad b=-4 \quad c=10$

$$x = \frac{4 \pm \sqrt{(-4)^2-4(1)(10)}}{2(1)} = \frac{4 \pm \sqrt{+16-40}}{2}$$

$$= \frac{4 \pm \sqrt{-24}}{2} \qquad i\sqrt{24} \quad 6\ 4\ 3\ 2\ 2\ 2$$

$$* = \frac{4 \pm 2i\sqrt{6}}{2} = \frac{2 \pm i\sqrt{6}}{1} \quad \boxed{2+i\sqrt{6}} \quad \boxed{2-i\sqrt{6}}$$

* The numbers outside the $\sqrt{}$ reduce all together or not at all

f) $2x^2 - 6x + 5 = 0$

g) $3x^2 - 8 = 0$

$3x^2 + 0x - 8 = 0$

If you are missing a term, fill it in with a 0

h) $5x^2 = 8 - 5n$

The best part about quadratic formula is that it always works for any quadratic in standard form.

Reducing examples:

$$\frac{6 \pm 10\sqrt{5}}{4} = \frac{3 \pm 5\sqrt{5}}{2} \quad \boxed{\frac{3+5\sqrt{5}}{2}} \quad \boxed{\frac{3-5\sqrt{5}}{2}}$$

All reduce by 2

vs.

$$\frac{8 \pm 3\sqrt{6}}{4} \quad \boxed{\frac{8+3\sqrt{6}}{4}} \quad \boxed{\frac{8-3\sqrt{6}}{4}}$$

These cannot reduce