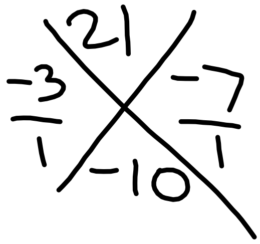
Bellwork: Solve the following equation

$x^2-10x+21=0$



$(x-3)(x-7)=0$

$\boxed{x=3,7}$

$x-\cancel{3}=0$

$\cancel{+3} \quad +3$

$x-\cancel{7}=0$

$\cancel{+7} \quad +7$

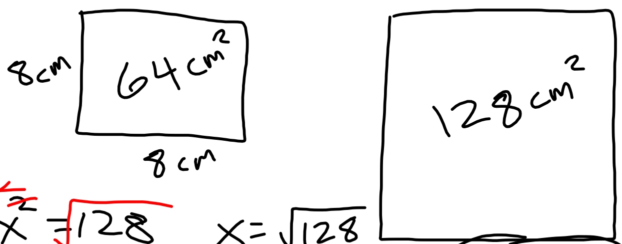
Homework 4.2 Solutions

14) $\sqrt{(2x+3)^2} = \sqrt{49}$ $\quad 2x+3 = \pm 7$

$$2x+3=7 \qquad 2x+3=-7$$
$$-3 \quad -3 \qquad -3 \quad -3$$
$$\frac{2x}{2}=\frac{4}{2} \qquad \frac{2x}{2}=\frac{-10}{2}$$

$$\boxed{x=2,-5}$$

19)



$\sqrt{x^2} = \sqrt{128}$ $\quad x = \sqrt{128}$

64 2

$\boxed{8\ 8}$

$x = 8\sqrt{2}$

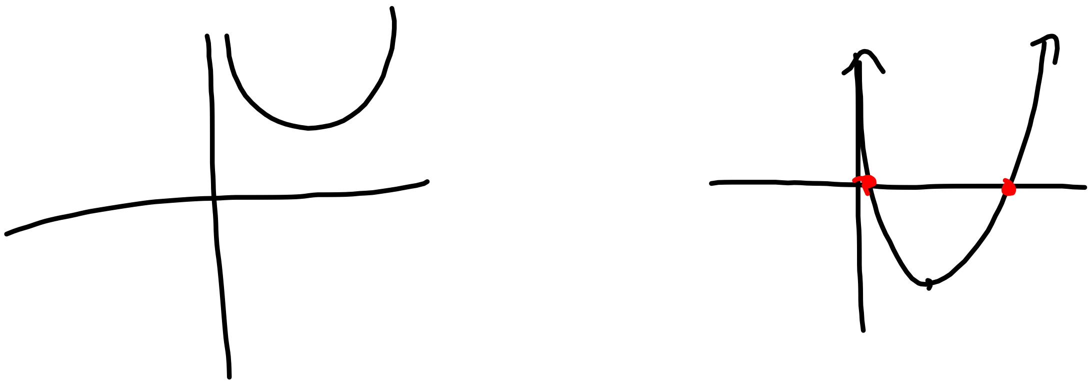
Today's Objectives:

I can solve quadratic equations using the quadratic formula

I can identify the vertex of a quadratic function in standard form

In the bellwork, we solved $x^2-10x+21=0$ by factoring.

But what about stuff that can't factor???



The Quadratic Formula

If $ax^2+bx+c=0$, and $a \neq 0$, then... $$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

When To Use the Quadratic Formula

The Quadratic Formula can be used to solve any quadratic equation in standard form. However, the factoring method can often be easier. The Quadratic Formula is especially useful for solving quadratic equations that:

- don't factor easily, or
- have complex solutions. (Solutions involving *i*)

1. $2x^2 - 6x + 3 = 0$ (a, b, c)

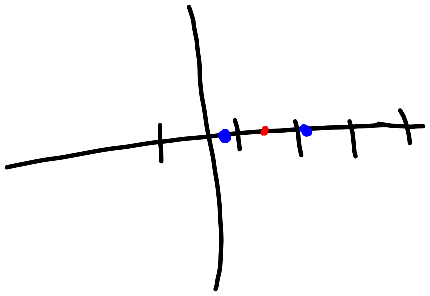
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{6 \pm \sqrt{(-6)^2 - 4(2)(3)}}{2(2)} = \frac{6 \pm \sqrt{12}}{4}$$

12
6 2
3 2

$$x = \frac{6 \pm 2\sqrt{3}}{4}$$

$$\boxed{x = \frac{3 \pm \sqrt{3}}{2}}$$



2. $x^2 + 2x + 10 = 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

a = 1

b = 2

c = 10

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

$$x = \frac{-2 \pm \sqrt{-36}}{2} = \frac{-2 \pm 6i}{2}$$

$$\boxed{x = -1 \pm 3i}$$

3. $x^2 + 10 = 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$a = 1$

$b = 0$

$c = 10$

$$x = \frac{0 \pm \sqrt{(0)^2 - 4(1)(10)}}{2(1)}$$

$$x = \frac{\pm\sqrt{-40}}{2}$$

$$x = \frac{\pm 2i\sqrt{10}}{2}$$

10 4

5 2 $\boxed{2\ 2}$

$$x = \pm i\sqrt{10}$$

4. $3x^2 + 6x - 5 = 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$a = 3$

$b = 6$

$c = -5$

$$x = \frac{-6 \pm \sqrt{(6)^2 - 4(3)(-5)}}{2(3)}$$

$$x = \frac{-6 \pm \sqrt{96}}{6}$$

$$x = \frac{-6 \pm 4\sqrt{6}}{6}$$

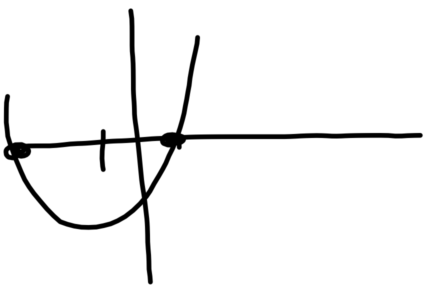
24 4

12 2 2 2

6 2

3 2

$$x = \frac{-3 \pm 2\sqrt{6}}{3}$$



USEFUL SIDE-EFFECTS FOR FUNCTIONS

The Quadratic Formula also gives us useful information about quadratic functions in standard form. In fact, the first half of the Formula gives us the x-part of the coordinate for the vertex of the parabola. In general:

For a quadratic function in the form $f(x) = ax^2 + bx + c$, the vertex of the parabola is found at $x = \frac{-b}{2a}$

Also remember that if you let $f(x) = ax^2 + bx + c = 0$, the solutions for x are the **x-intercepts** of the function.

Identify the vertex of the parabola graphed by the given function.

5. $f(x) = x^2 + 8x - 10$

$x = \frac{-b}{2a} = \frac{-8}{2(1)} = -4$

$\boxed{(-4, -26)}$

$(-4)^2 + 8(-4) - 10$

$16 - 32 - 10$

6. $f(x) = 2x^2 - 6x + 1$

$\left(\frac{-b}{2a}, \text{plug in}\right)$

$2(1.5)^2 - 6(1.5) + 1$

$\frac{6}{2(2)} = \frac{6}{4} = \frac{3}{2} = 1.5$

$\left(3/2, -7/2\right)$

$(1.5, -3.5)$