**5.1 – Solving Quadratics with Square Roots (A.SSE.3)**

You can solve for the x-intercepts in a quadratic function, even if you are given the function in vertex form. You just have to remember the rules for solving a square root, that you have **two** solutions, the **positive** and the **negative**.

Example 1: Find the roots of the function: 

|  |  |
| --- | --- |
| Steps: | Solving: |

|  |  |
| --- | --- |
| Ex. 2)  Ex. 4) $\frac{1}{2}x^{2}-5=13$ | Ex. 3)  Ex. 5) $2\left(3x+2\right)^{2}-6=18$ |
|  |  |

**5.2 Solving Quadratic Functions by Factoring (finding zeros) (A.SSE.3)**

**Finding zeros of the product property:** When a function is in factored form, $f\left(x\right)=a\left(x-p\right)\left(x-q\right)$, the Zero Product Property can be used to find the zeros of the function.

Example 1: Find the zeros for the function: 

|  |  |
| --- | --- |
| Steps: | Solving: |

**If the function is in Standard Form factor first, then solve to find the roots.**

Example 2: Find the roots of the function: 

Example 3: Find the solutions for the function: 

**5.3/5.4 Discriminants and the Quadratic Formula**

The **quadratic formula**, $x=\frac{-b\pm \sqrt{b^{2}-4ac}}{2a}$, can be used to find the solutions of the quadratic equation $ax^{2}+bx+c=0,$when $a\ne 0$, it is most useful when a function is not factorable. The radicand of the quadratic formula, $b^{2}-4ac$, is called the **discriminant**. It can be used to determine the number and type of solutions to the quadratic equation $ax^{2}+bx+c=0$.

* If $b^{2}-4ac>0$, then there are two real solutions to the quadratic equation, and the graph crosses at each x-intercept.
* If $b^{2}-4ac=0$, then there is one real solution to the quadratic equation, and the graph touches at one x-intercept.
* If $b^{2}-4ac<0$, then there are no real, but two imaginary solutions to the quadratic equation, and the graph never touches the x-axis.

Determine the number and type of solutions using the discriminant for the equations below.

1.  b) 

**To solve using the Quadratic Formula:**

1) 2)

3) 4)

Solve the following equations using the quadratic formula:

c)  d) 

**5.5 Completing the Square (F.IF.8)**

**Completing the square is the process of transforming a quadratic function from standard form (**$ax^{2}+bx+c$**) to vertex form (**$a\left(x-h\right)^{2}+k$**). By doing this we create a perfect square within our function and we also are given the vertex of the function.**

**To complete the square:**

**To solve a quadratic function using the completing the square method, allows you to find the vertex of the function in addition to the x-intercepts.**

|  |  |
| --- | --- |
| Find the c value to complete the square | Find the c value to complete the square |
|  |  |

|  |  |
| --- | --- |
| Standard Form: $f\left(x\right)=ax^{2}+bx+c$ to Vertex Form: $f\left(x\right)=a\left(x-h\right)^{2}+k$ | Standard form: $f\left(x\right)=x^{2}+bx+c$ to Vertex form: $f\left(x\right)=\left(x-h\right)^{2}+k$ |
| Solve by Completing the square:$$k^{2}+6k-58=0$$ | Convert the follow function to vertex form:$$9a^{2}+13a-92=0$$ |

**\*If a>0 the vertex of the graph is a minimum value, if a<0 the vertex of the graph is a maximum value.**