The Discriminant

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

Within the quadratic formula lies the discriminant. The discriminant, \( b^2 - 4ac \), tells you about your solutions.

- **If** \( b^2 - 4ac > 0 \) **you will have two real solutions**
- **If** \( b^2 - 4ac = 0 \) **you will have one real solution**
- **If** \( b^2 - 4ac < 0 \) **you will have no real solutions**

Think about what this means in terms of the graph of the function. The quadratic formula allows you to find roots of a quadratic equation. If the quadratic is given to you as a function, then you are finding the zeros of the function. The only difference is an equation verses a function. In other words, one of them has \( f(x) \) in front of it. In either case, whether you are being asked to find the roots of the equation, or the zeros of the function, you are solving for \( x \). So, finding the roots of an equation involve the same procedures as finding the zeros of a function. As we have discussed in class, the zeros of a function are the \( x \) intercepts of the graph of that function.

Therefore, as an extension, you can conclude the following.

- **If** \( b^2 - 4ac > 0 \) **you will have two \( x \) intercepts**
- **If** \( b^2 - 4ac = 0 \) **you will have one \( x \) intercept**
- **If** \( b^2 - 4ac < 0 \) **you will have no \( x \) intercepts**