**Example 1: Using the Quadratic Formula**

[**https://www.youtube.com/watch?v=iulx0z1lz8M**](https://www.youtube.com/watch?v=iulx0z1lz8M)

1. Citric acid is a weak acid that ionizes to form hydronium (H3O+) ions and citrate (C6H7O7-) ions. The reaction is:

C6H8O7 + H2O ↔ C6H7O7-(aq) + H3O+(aq)

To solve for the equilibrium concentration (call it x) of acidic, or hydronium ions, one needs to solve the quadratic equation:

x2 + (7.4 X 10-4)x – (7.4 X 10-4) = 0

Solve for the equilibrium concentration of hydronium ions. Note that only the positive solution is physically meaningful.

1. Now consider the extremely weak acid HIO (hypoiodous acid). This acid ionizes according to the equation:

HIO + H2O ↔ H3O+(aq) + IO-(aq)

It has an equilibrium constant defined by:

Ka=[H3O+(aq)][IO-(aq)]/[ HIO ]

For a 1 M solution of HIO, the equilibrium expression for an unknown concentration (x)of acidic ions at equilibrium would be:

(x)(x)/(1-x) = 3.2 X 10-11

Now, you will have a chance to use an approximation that we will use frequently in the course. Since Ka is so small, that means that we state that x<<1 (M), and that (1-x) is almost exactly the same as 1. Use this approximation to solve for x.