Stark syra + stark bas

$$HA + H_2O \rightarrow A^- + H_3O^+$$

$$[HA]_1 = [A^-]$$

$$BOH \xrightarrow{H_2O} B^+ + OH^-$$

$$[BOH]_1 = [B^+]$$

$$K_w = [OH^-][H_3O^+] \Leftrightarrow [OH^-] = \frac{K_w}{[H_3O^+]}$$

$$[B^+] + [H_3O^+] = [A^-] + [OH^-]$$

$$[BOH]_1 + [H_3O^+] = [HA]_1 + [OH^-]$$

$$[BOH]_1 + [H_3O^+] = [HA]_1 + \frac{K_w}{[H_3O^+]}$$

$$\frac{K_w}{[H_3O^+]} - [H_3O^+] + [HA]_1 - [BOH]_1 = 0$$

$$K_w - [H_3O^+]^2 + [H_3O^+][HA]_1 - [H_3O^+][BOH]_1 = 0$$

$$[H_3O^+]^2 - [H_3O^+][HA]_1 + [H_3O^+][BOH]_1 - K_w = 0$$

$$[H_3O^+]^2 - [H_3O^+]([HA]_1 - [BOH]_1) - K_w = 0$$

$$[H_3O^+] = \frac{[HA]_1 - [BOH]_1}{2} \pm \sqrt{\left(\frac{[HA]_1 - [BOH]_1}{2}\right)^2 + K_w}$$

$$[H_3O^+] = \frac{[HA]_1 - [BOH]_1}{2} + \sqrt{\left(\frac{[HA]_1 - [BOH]_1}{2}\right)^2 + K_w}$$