Show $[OH^-]$ = [base] at $V_{base} = \infty$ in acid – base titration.

Situation:

- add strong base to strong acid (or weak acid)
- acid & base are monoprotic

At $V_{base} > V_{base\ at\ end\ point}$,

$$[OH^-] \quad = \quad \frac{n_{OH^-}}{V_{total}} \quad = \quad \frac{n_{base} - n_{acid}}{V_{total}} \quad = \quad \frac{[B]V_b - [A]V_a}{V_a + V_b}.$$

$At\, V_b \quad = \quad \infty,$

$$\lim_{V_b \to \infty} [OH^-] \quad = \quad \lim_{V_b \to \infty} \frac{[B]V_b - [A]V_a}{V_a + V_b} \qquad [eqn.1]$$

$$= \quad \lim_{V_b \to \infty} \frac{[B] \; - [A]\dfrac{V_a}{V_b}}{\dfrac{V_a}{V_b} + 1} \quad = \quad [B]$$

alternatively, apply L’Hopital’s rule to [eqn. 1]. That is, at $V_b = \infty$, $[OH^-]$ = [base]; thus at $V_b = \infty$, pH = pH_{base}

As such, when sketching an acid-base titration curve, the pH at $V_b = \infty$ is the pH of the base. A similar argument would apply to the addition of a strong acid to strong / weak base: $[H^+]$ = [acid] at $V_a = \infty$.