# Exchangement Lemma (Lemma 4.3.2)

If the following SLD resolution steps are possible

$$\{\neg A_1, \ldots, \underline{\neg A_i}, \ldots, \neg A_j, \ldots, \neg A_k\} \qquad \{\underline{B}, \neg C_1, \ldots, \neg C_n\}$$

$$\sigma_1(\{\neg A_1, \ldots, \neg C_1, \ldots, \neg C_n, \ldots, \underline{\neg A_j}, \ldots, \neg A_k\}) \qquad \{\underline{D}, \neg E_1, \ldots, \neg E_m\}$$

$$\sigma_2(\sigma_1(\{\neg A_1, \ldots, \neg C_1, \ldots, \neg C_n, \ldots, \neg E_1, \ldots, \neg E_m, \ldots, \neg A_k\}))$$

then the following SLD resolution steps are possible as well:

$$\{\neg A_1, \ldots, \neg A_i, \ldots, \underline{\neg A_j}, \ldots, \neg A_k\} \qquad \{\underline{D}, \neg E_1, \ldots, \neg E_m\}$$

$$\sigma'_1(\{\neg A_1, \ldots, \underline{\neg A_i}, \ldots, \neg E_1, \ldots, \neg E_m \ldots, \neg A_k\}) \qquad \{\underline{B}, \neg C_1, \ldots, \neg C_n\}$$

$$\sigma'_2(\sigma'_1(\{\neg A_1, \ldots, \neg C_1, \ldots, \neg C_n, \ldots, \neg E_1, \ldots, \neg E_m, \ldots, \neg A_k\}))$$

Here, $\sigma'_2 \circ \sigma'_1 = \nu \circ \sigma_2 \circ \sigma_1$ for a variable renaming $\nu$.