Derivations of ① and ②

① $x = \sum c_j w_j$, w_j orthonormal. $\Rightarrow$

$$\langle x, w_i \rangle = \sum c_j \langle w_j, w_i \rangle = c_i \cdot 1 = c_i.$$

$\langle w_j, w_i \rangle = \begin{cases} 0 & j \neq i \\ 1 & j = i \end{cases}$

② $$\langle x, y \rangle = \left\langle \sum_i a_i w_i, \sum_j b_j w_j \right\rangle =$$

$$\sum_{i,j} a_i \bar{b}_j \langle w_i, w_j \rangle \overset{\text{since } \langle w_i, w_j \rangle = \begin{cases} 0 & i \neq j \\ 1 & i = j \end{cases}}{=\!=} \sum_j a_j \bar{b}_j$$