$$\begin{tikzcd}
c_1 = \langle X^*, & Y \rangle \arrow[r, "\mathrm{Hom}_{\mathbf{C}}"] \arrow[d, "f_2"] & \mathrm{Hom}_{\mathbf{C}}(X; Y) \arrow[d, "\mathrm{Hom}_{\mathbf{C}}(g)"] \\
c_2 = \langle Z^*, & U \rangle \arrow[r, "\mathrm{Hom}_{\mathbf{C}}"] & \mathrm{Hom}_{\mathbf{C}}(Z; U)
\end{tikzcd}$$

$$c_1 \xrightarrow{f} c_2, \quad X^* \xrightarrow{f_1^*} Z^*, \quad Y \xrightarrow{f_2} U$$