$$
\begin{tikzcd}
c_1 = \langle X^*, & [-2em] Y \rangle \arrow[rr, "\mathrm{Hom}_{\mathbf{C}}"] & & \mathrm{Hom}_{\mathbf{C}}(X;Y) \arrow[d, "\mathrm{Hom}_{\mathbf{C}}(g)"] \\
c_2 = \langle Z^*, \arrow[u, phantom] & U \rangle \arrow[rr, "\mathrm{Hom}_{\mathbf{C}}"] & & \mathrm{Hom}_{\mathbf{C}}(Z;U)
\end{tikzcd}
$$

$$
\begin{array}{ccccc}
c_1 & = \langle & X^*, & Y \rangle & \xrightarrow{\mathrm{Hom}_{\mathbf{C}}} \mathrm{Hom}_{\mathbf{C}}(X;Y) \\
\downarrow f & & \downarrow f_1^* & \downarrow f_2 & \qquad\qquad \downarrow \mathrm{Hom}_{\mathbf{C}}(g) \\
c_2 & = \langle & Z^*, & U \rangle & \xrightarrow{\mathrm{Hom}_{\mathbf{C}}} \mathrm{Hom}_{\mathbf{C}}(Z;U)
\end{array}
$$