

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

The diagram illustrates a commutative square in the context of category theory. The top row shows the object  $c_1 = \langle X^*, Y \rangle$  mapping to the hom-object  $\text{Hom}_{\mathbf{C}}(X; Y)$  via the  $\text{Hom}_{\mathbf{C}}$  functor. The bottom row shows the object  $c_2 = \langle Z^*, U \rangle$  mapping to the hom-object  $\text{Hom}_{\mathbf{C}}(Z; U)$  via the same functor. The vertical arrows represent the action of the functor on the components of the objects:  $f$  maps  $X^*$  to  $Z^*$ ,  $f_1^*$  maps  $X^*$  to  $Z^*$ ,  $f_2$  maps  $Y$  to  $U$ , and  $\text{Hom}_{\mathbf{C}}(g)$  maps the hom-object  $\text{Hom}_{\mathbf{C}}(X; Y)$  to  $\text{Hom}_{\mathbf{C}}(Z; U)$ .