$$\operatorname{Hom}(A',B) \xrightarrow{h^*} \operatorname{Hom}(A,B)$$

$$\downarrow^{k_*} \qquad \qquad \downarrow^{k_*}$$

$$\operatorname{Hom}(A',B') \xrightarrow{h^*} \operatorname{Hom}(A,B')$$