

$$\begin{array}{ccccc}
F_H(G) & \xrightarrow{F_H(\varphi)} & F_H(G) & & \text{Hom}(G, H) \xrightarrow{(-)\circ\varphi} \text{Hom}(G', H) \\
\downarrow F^G(\varphi) & & \downarrow F^{G'}(\psi) & = & \downarrow \psi\circ(-) \\
F^{G'}(H) & \xrightarrow{F_H(\psi)} & F^{G'}(H) & & \text{Hom}(G, H') \xrightarrow{(-)\circ\varphi} \text{Hom}(G', H') \\
& & & & \downarrow \psi\circ(-)
\end{array}$$