

$$\begin{array}{ccccc}
 X & & F(X) & \xrightarrow{\quad \Phi_X \quad} & G(X) \\
 \downarrow f & & \downarrow F(f) & & \downarrow G(f) \\
 Y & & F(Y) & \xrightarrow{\quad \Phi_Y \quad} & G(Y)
 \end{array}$$