

$$\begin{aligned}
\text{Hom}_{\mathbf{C}}(f \circ g)(z) &= (g_1 \circ f_1) \circ z \circ (f_2 \circ g_2) \\
&= g_1 \circ (f_1 \circ z \circ f_2) \circ g_2 \\
&= (f_1 \circ z \circ f_2) \circ \text{Hom}_{\mathbf{C}}(g) \\
&= (\text{Hom}_{\mathbf{C}}(f) \circ \text{Hom}_{\mathbf{C}}(g))(z),
\end{aligned}$$