

3.1 Let A, B, C be objects in \mathcal{C} and hence objects in \mathcal{C}^{op} . Let $f \in \text{Hom}_{\mathcal{C}^{op}}(A, B)$ and $g \in \text{Hom}_{\mathcal{C}^{op}}(B, C)$. Thus $f \in \text{Hom}_{\mathcal{C}}(B, A)$ and $g \in \text{Hom}_{\mathcal{C}}(C, B)$. Since \mathcal{C} is a category, the morphism $f \circ_{\mathcal{C}} g$ exists in \mathcal{C} . Define $\circ_{\mathcal{C}^{op}}$ as $g \circ_{\mathcal{C}^{op}} f := f \circ_{\mathcal{C}} g$. We are guaranteed that the composition of morphisms exists since \mathcal{C} is a category. We gain associativity for the same reason. The composition of identity in \mathcal{C}^{op} becomes composition of identity on the other side in \mathcal{C} , which is still an identity.