

Covariant Functor

$$\begin{array}{ccc} \text{loop at } A \xrightarrow{id_A} & \xRightarrow{F} & \text{loop at } FA \xrightarrow{F(id_A)=id_{FA}} \end{array}$$

$$\begin{array}{ccc} \begin{array}{ccc} A & \xrightarrow{f} & B \\ & \searrow g \circ f & \downarrow g \\ & & C \end{array} & \xRightarrow{F} & \begin{array}{ccc} FA & \xrightarrow{Ff} & FB \\ & \searrow Fg \circ Ff & \downarrow Fg \\ & & FC \end{array} \end{array}$$

Contravariant Functor

$$\begin{array}{ccc} \text{loop at } A \xrightarrow{id_A} & \xRightarrow{F} & \text{loop at } FA \xrightarrow{F(id_A)=id_{FA}} \end{array}$$

$$\begin{array}{ccc} \begin{array}{ccc} A & \xrightarrow{f} & B \\ & \searrow g \circ f & \downarrow g \\ & & C \end{array} & \xRightarrow{F} & \begin{array}{ccc} FA & \xleftarrow{Ff} & FB \\ & \nearrow Ff \circ Fg & \uparrow Fg \\ & & FC \end{array} \end{array}$$