

Step 3

$$\begin{array}{ccccc}
 & S^0 \wedge S^0 & \xrightarrow{\text{id}_{\text{Sets}_*|S^0, S^0}^{\otimes, -1}} & S^0 \otimes_{\text{Sets}_*} S^0 & \\
 \nearrow \rho_{S^0}^{\text{Sets}_*, -1} & & & & \searrow S^0 \text{id}_{S^0} \wedge \text{id}_{\mathbb{1}/\text{Sets}_*}^{\otimes, -1} \\
 S^0 & \xrightarrow{\rho_{S^0}^{\prime, -1}} & S^0 \otimes_{\text{Sets}_*} \mathbb{1}_{\text{Sets}_*} & & \\
 \downarrow [x] \wedge \text{id}_{S^0} & (1) & \downarrow [x] \otimes_{\text{Sets}_*} \text{id}_{S^0} & & \\
 (3) & & (4) & & \\
 & X \wedge S^0 & \xrightarrow{\text{id}_{\text{Sets}_*|X, S^0}^{\otimes, -1}} & X \otimes_{\text{Sets}_*} S^0 & \\
 \nearrow \rho_X^{\text{Sets}_*, -1} & & & & \searrow \text{id}_X \wedge \text{id}_{\mathbb{1}/\text{Sets}_*}^{\otimes, -1} \\
 X & \xrightarrow{\rho_X^{\prime, -1}} & X \otimes_{\text{Sets}_*} \mathbb{1}_{\text{Sets}_*} & & \\
 & (2) & & & \\
 & & & & \downarrow [x] \wedge \text{id}_{\mathbb{1}/\text{Sets}_*}
 \end{array}$$

Diagram illustrating the commutative relations in Step 3, involving objects S^0 , X , and $\mathbb{1}_{\text{Sets}_*}$ in the category Sets_* .

The diagram shows the following components and maps:

- Top Row:** $S^0 \wedge S^0 \xrightarrow{\text{id}_{\text{Sets}_*|S^0, S^0}^{\otimes, -1}} S^0 \otimes_{\text{Sets}_*} S^0$
- Left Column:** $S^0 \xrightarrow{\rho_{S^0}^{\text{Sets}_*, -1}} S^0 \wedge S^0$ and $S^0 \xrightarrow{[x]} X$
- Right Column:** $S^0 \otimes_{\text{Sets}_*} S^0 \xrightarrow{S^0 \text{id}_{S^0} \wedge \text{id}_{\mathbb{1}/\text{Sets}_*}^{\otimes, -1}} S^0 \otimes_{\text{Sets}_*} \mathbb{1}_{\text{Sets}_*}$
- Horizontal Maps:** $S^0 \xrightarrow{\rho_{S^0}^{\prime, -1}} S^0 \otimes_{\text{Sets}_*} \mathbb{1}_{\text{Sets}_*}$ and $X \xrightarrow{\rho_X^{\prime, -1}} X \otimes_{\text{Sets}_*} \mathbb{1}_{\text{Sets}_*}$
- Vertical Maps:**
 - $S^0 \wedge S^0 \xrightarrow{[x] \wedge \text{id}_{S^0}} X \wedge S^0$ (labeled (3))
 - $S^0 \otimes_{\text{Sets}_*} S^0 \xrightarrow{[x] \otimes_{\text{Sets}_*} \text{id}_{S^0}} X \otimes_{\text{Sets}_*} S^0$ (labeled (4))
 - $X \wedge S^0 \xrightarrow{\rho_X^{\text{Sets}_*, -1}} X \otimes_{\text{Sets}_*} S^0$ (labeled (2))
 - $X \otimes_{\text{Sets}_*} S^0 \xrightarrow{\text{id}_X \wedge \text{id}_{\mathbb{1}/\text{Sets}_*}^{\otimes, -1}} X \otimes_{\text{Sets}_*} \mathbb{1}_{\text{Sets}_*}$ (labeled (5))
 - $X \otimes_{\text{Sets}_*} \mathbb{1}_{\text{Sets}_*} \xrightarrow{[x] \wedge \text{id}_{\mathbb{1}/\text{Sets}_*}} X \otimes_{\text{Sets}_*} \mathbb{1}_{\text{Sets}_*}$ (labeled (4))