

Diagram 11 Thm. 2.2

$$\begin{array}{ccc} U_a \otimes U_b & \xrightarrow{\mu_{a,b}} & U_{a+b} \\ \beta \downarrow & & \downarrow U_\beta \\ U_b \otimes U_a & \xrightarrow{\mu_{b,a}} & U_{b+a} \end{array}$$

(1) Right & then down:

$$\begin{array}{ccccccc} 1 & \longrightarrow & F(a) \times F(a) & \longrightarrow & F(a) \times F(b) & \longrightarrow & F(a+b) \\ \downarrow \mu_{a,b} & & \downarrow & & \nearrow & & \downarrow 1 \\ 1 & \longrightarrow & F(a+b) & \longrightarrow & F(a+b) & & \\ \downarrow U_\beta & & \downarrow F(\beta)=1 & & & & \downarrow \\ 1 & \longrightarrow & F(a+b) & \longrightarrow & F(b+a) & & \end{array}$$

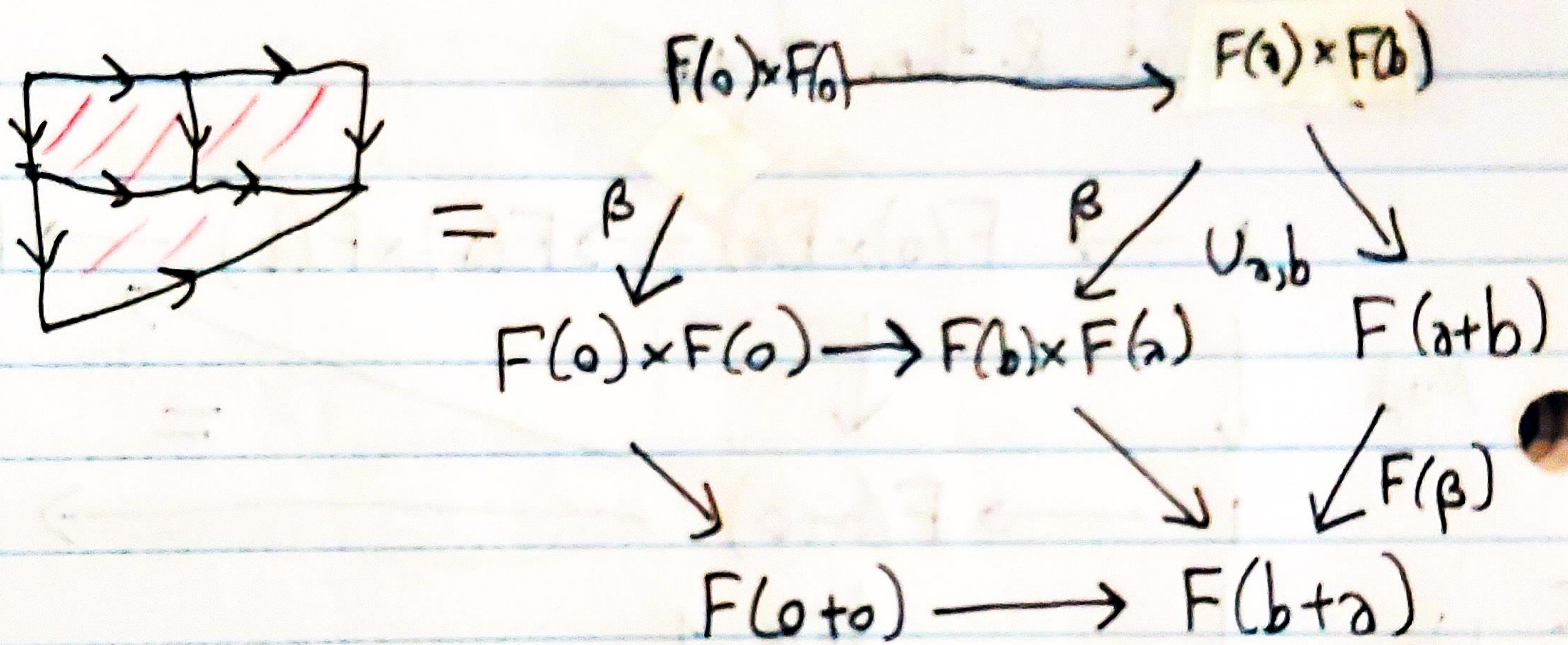
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Down & then right:

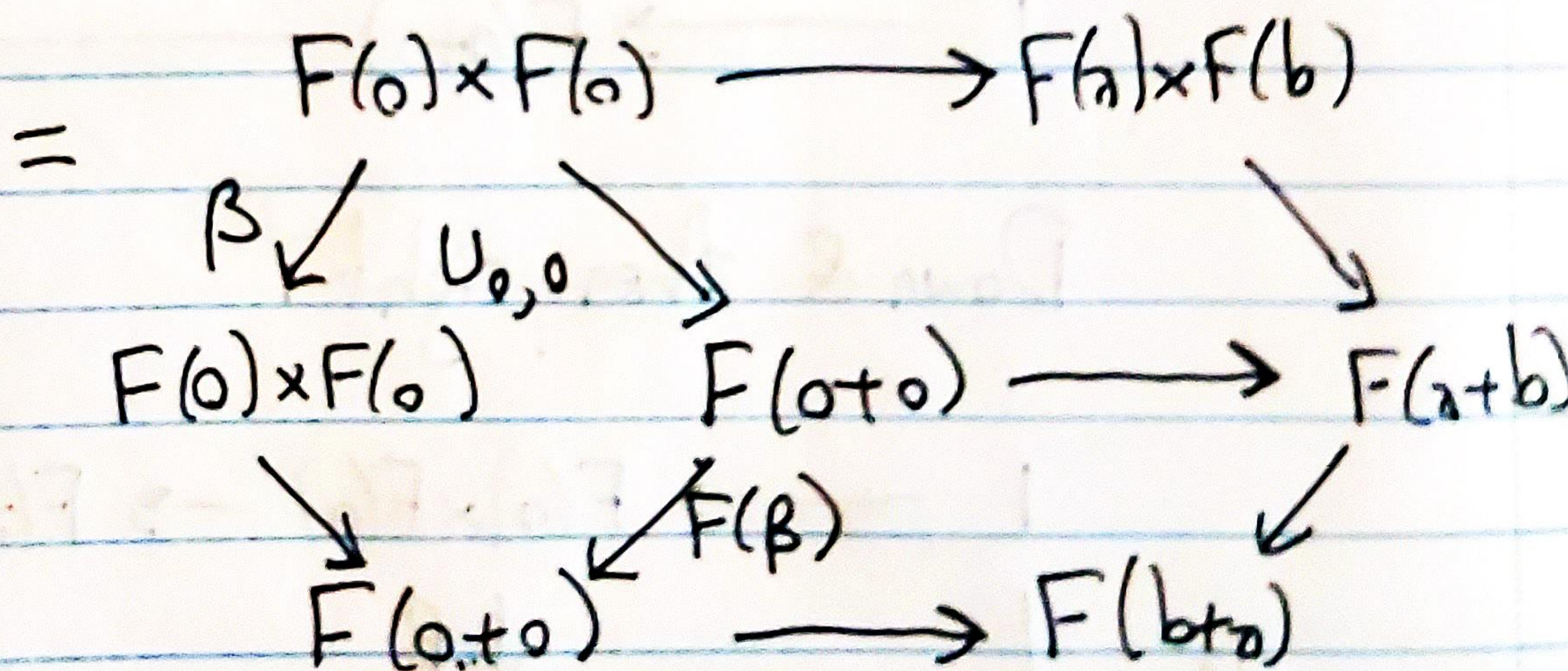
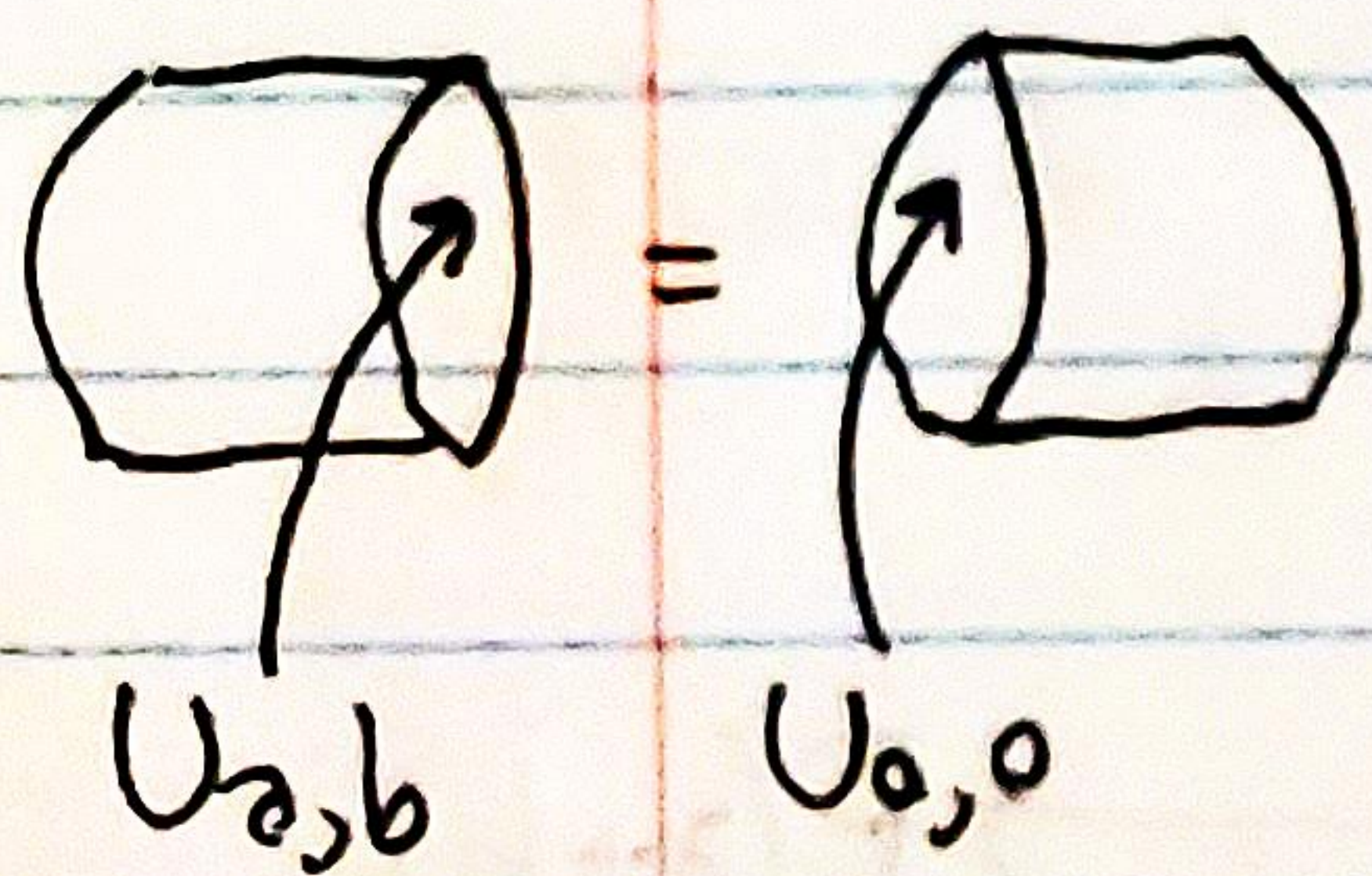
$$\begin{array}{ccccccc} 1 & \longrightarrow & F(a) \times F(a) & \longrightarrow & F(a) \times F(b) & \longrightarrow & F(a+b) \\ \downarrow \beta & & \downarrow \beta & & \downarrow \beta & & \downarrow F(\beta) \\ 1 & \longrightarrow & F(a) \times F(a) & \longrightarrow & F(b) \times F(a) & \longrightarrow & F(b+a) \\ \downarrow \mu_{b,a} & & \downarrow & & \nearrow & & \downarrow 1 \\ 1 & \longrightarrow & F(a+b) & \longrightarrow & F(b+a) & & \end{array}$$

All unlabelled 1-cells & 2-cells are "the obvious thing".

The 3 red regions in "down & then right"
are one side of the tin can equation for the
modification $U_{a,b}$:

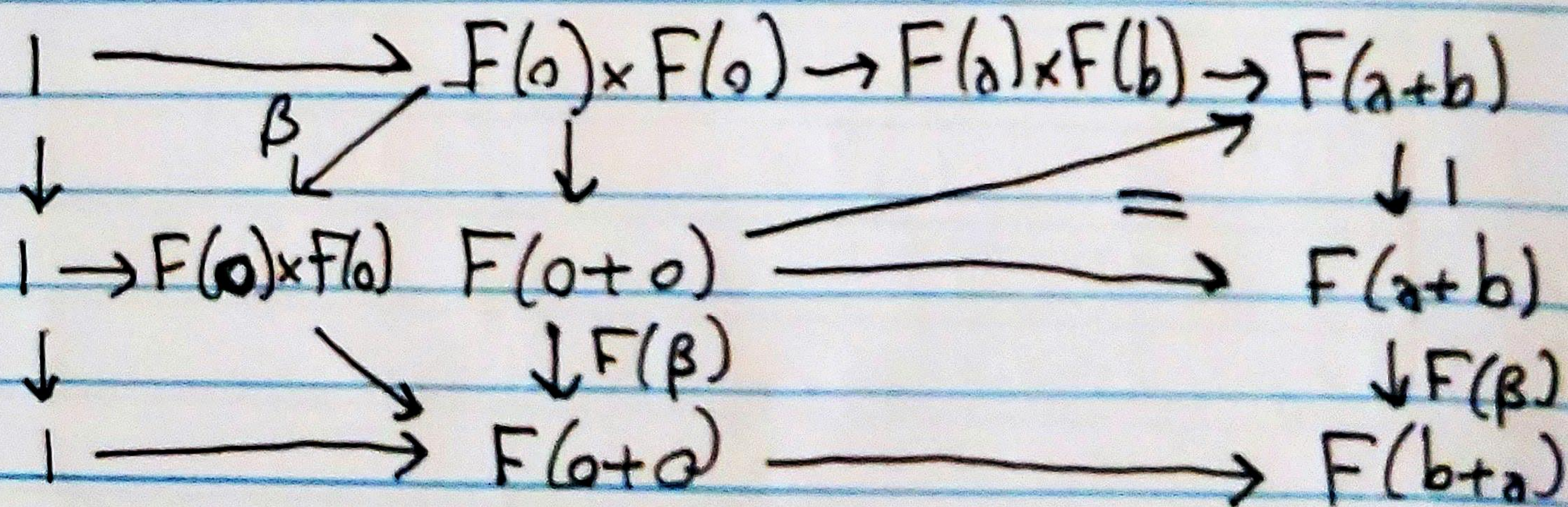
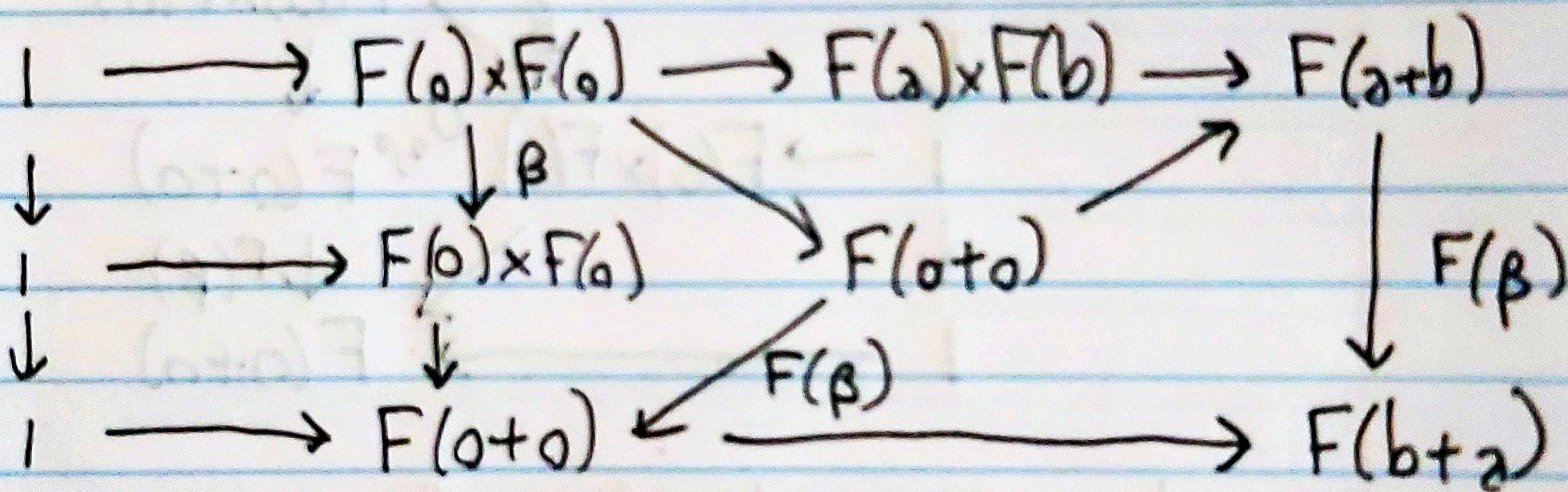
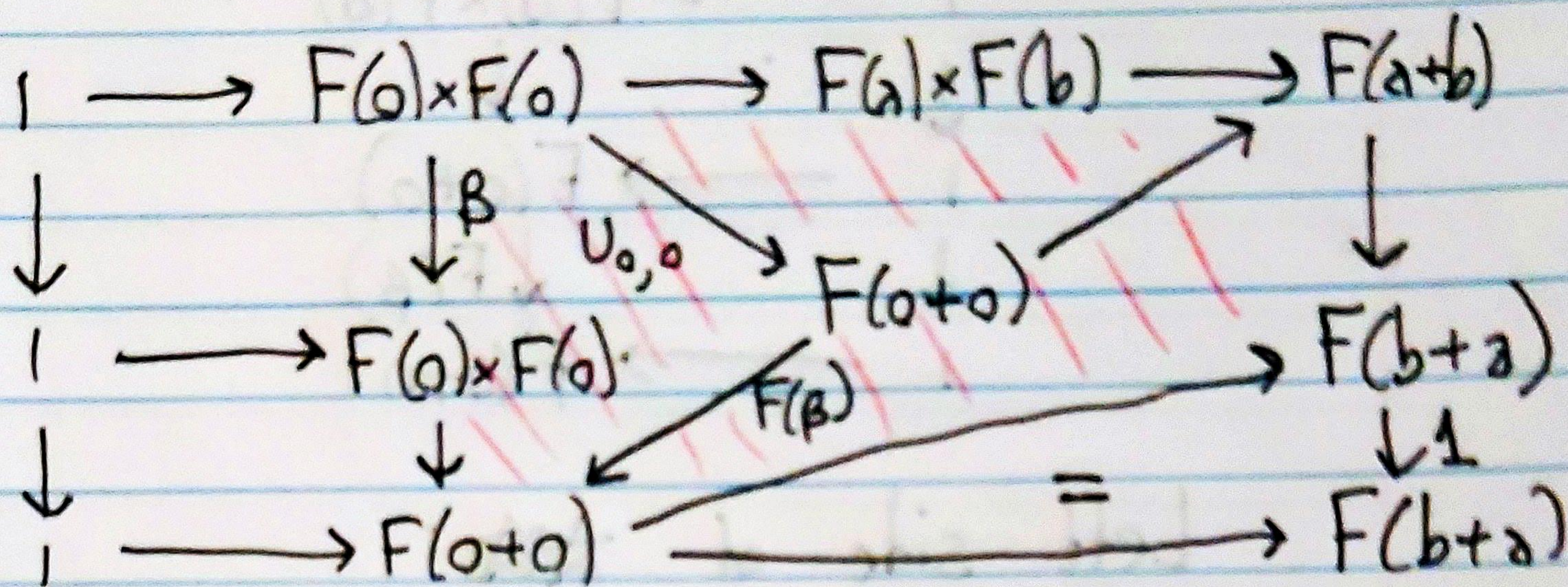


Tin can:



So replace it ~~with~~ with the other side!

Down and then right:



(We're just redrawing here. But compare $\star\star$ to \star ! They differ only in their left side!)

Left side of \star :

$$\begin{array}{ccc}
 1 & \longrightarrow & F(0) \times F(0) \\
 \downarrow & & \downarrow \\
 1 & \longrightarrow & F(0+0) \\
 \downarrow & & \downarrow F(\beta) \\
 1 & \longrightarrow & F(0+0)
 \end{array}$$

Left side of $\star\star$:

$$\begin{array}{ccc}
 1 & \longrightarrow & F(0) \times F(0) \\
 \downarrow & \searrow \beta & \downarrow \\
 1 & \longrightarrow F(0) \times F(0) & \xrightarrow{U_{0,0}} F(0+0) \\
 \downarrow & \searrow & \downarrow F(\beta) \\
 1 & \longrightarrow & F(0+0)
 \end{array}$$

It suffices to show these are equal!