

$$1) \Pi_{sname}(\Pi_{sid}((\Pi_{pid} \sigma_{color=red} Parts) \bowtie Catalog) \bowtie Suppliers)$$

$$2) \Pi_{sid}(\Pi_{pid}(\sigma_{color=red \vee color=green} Parts) \bowtie Catalog)$$

$$3) \begin{aligned} \rho(\Pi_{sid}((\Pi_{pid} \sigma_{color=red} Parts) \bowtie Catalog)) &\longrightarrow R_1 \\ \rho(\Pi_{sid} \sigma_{address=221PackerStreet} Suppliers) &\longrightarrow R_2 \\ R_1 \cup R_2 \end{aligned}$$

$$4) \begin{aligned} \rho(\Pi_{sid}((\Pi_{pid} \sigma_{color=red} Parts) \bowtie Catalog)) &\longrightarrow R_1 \\ \rho(\Pi_{sid}((\Pi_{pid} \sigma_{color=green} Parts) \bowtie Catalog)) &\longrightarrow R_2 \\ R_1 \cap R_2 \end{aligned}$$

$$5) (\Pi_{sid,pid} Catalog) - (\Pi_{pid} Parts)$$

$$6) (\Pi_{sid,pid} Catalog) - (\Pi_{pid} \sigma_{color=red} Parts)$$

$$7) (\Pi_{sid,pid} Catalog) - (\Pi_{pid} \sigma_{color=red \vee color=green} Parts)$$

$$8) \begin{aligned} \rho((\Pi_{sid,pid} Catalog) - (\Pi_{pid} \sigma_{color=red} Parts)) &\longrightarrow R_1 \\ \rho((\Pi_{sid,pid} Catalog) - (\Pi_{pid} \sigma_{color=green} Parts)) &\longrightarrow R_2 \\ R_1 \cup R_2 \end{aligned}$$

$$9) \rho Catalog \longrightarrow R_1$$

$$\rho Catalog \longrightarrow R_2$$

$$\Pi_{R1.sid, R2.sid}(\sigma_{R1.pid=R2.pid \wedge R1.sid \neq R2.sid \wedge R1.cost > R2.cost}(R_1 \times R_2))$$

$$10) \rho Catalog \longrightarrow R_1$$

$$\rho Catalog \longrightarrow R_2$$

$$\Pi_{R1.pid} \sigma_{R1.pid=R2.pid \wedge R1.sid \neq R2.sid}(R_1 \times R_2)$$