

### Question 1B

- i)  $\pi_{sname}((\sigma_{color="red"}(Parts)) \bowtie Catalog \bowtie Suppliers)$
- ii)  $\pi_{sid}(\sigma_{color="red" \vee color="green"}(Part) \bowtie Catalog)$
- iii)  $R_1 = (\pi_{sid}((\pi_{pid} \sigma_{color="red"}(Parts)) \bowtie Catalog))$   
 $R_2 = (\pi_{sid} \sigma_{address="1065 Military Trail"}(Suppliers))$   
 $R_1 \cup R_2$
- iv)  $\pi_{sid}(\sigma_{color="red" \wedge color="green"}(Parts) \bowtie Catalog)$
- v)  $\pi_{sid}(Catalog) - \pi_{sid}((\pi_{sid}(Catalog) \times \pi_{pid}(Catalog)) - \pi_{sid,pid}(Catalog))$
- vi)  $\pi_{sid}(Catalog) - \pi_{sid}((\pi_{sid}(Catalog) \times \pi_{pid}(\sigma_{color="red"}(Parts))) - \pi_{sid,pid}(Catalog))$
- vii)  $\pi_{sid}(Catalog) - \pi_{sid}((\pi_{sid}(Catalog) \times \pi_{pid}(\sigma_{color="red" \vee "green"}(Parts))) - \pi_{sid,pid}(Catalog))$
- viii)  $\pi_{sid}(Catalog) - \pi_{sid}((\pi_{sid}(Catalog) \times \pi_{pid}(\sigma_{color="red"}(Parts))) - \pi_{sid,pid}(Catalog)) \vee$   
 $\pi_{sid}(Catalog) - \pi_{sid}((\pi_{sid}(Catalog) \times \pi_{pid}(\sigma_{color="green"}(Parts))) - \pi_{sid,pid}(Catalog))$
- ix)  $R_1 = \rho_{R_1} Catalog$   
 $R_2 = \rho_{R_2} Catalog$   
 $\pi_{R_1.sid, R_2.sid}(\sigma_{R_1.pid = R_2.pid \wedge R_1.sid \neq R_2.sid \wedge R_1.cost > R_2.cost}(R_1 \times R_2))$
- x)  $\rho_{R_1}(Catalog), \rho_{R_2}(Catalog)$   
 $\pi_{R_1.pid}(\sigma_{R_1.pid = R_2.pid \wedge R_1.sid \neq R_2.sid}(R_1 \times R_2))$

xi)  $R_1 = \sigma_{sname = "canada Suppliers"}(Suppliers)$

$R_2 = \pi_{pid, cost}(R_1 \bowtie catalog)$

$R_3 = \rho_3(R_2)$

$R_4 = \rho_4(R_2)$

$R_5 = \sigma_{R_3.cost > R_4.cost}(R_4)$

$R_6 = \pi_{pid}(\pi_{pid}(catalog) - \pi_{R_3.pid}(R_5))$

xii)  $R_1 = \sigma_{cost < 200}(catalog)$

$R_2 = \pi_{sid}(R_1) \times \pi_{pid}(R_1)$

$R_3 = R_2 - R_1$

$R_4 = \pi_{pid}(R_1) - \pi_{pid}(R_3)$

$R_5 = \pi_{pid}(\sigma_{cost > 200}(catalog))$

$R_6 = \pi_{pid}(R_4 - R_5)$