b.

i. $\Pi_{sname}(\Pi_{sid}(\sigma_{color='red'}(Parts) \bowtie Catalog) \bowtie Suppliers)$

ii. $R1 = (\sigma_{color='red'}(Parts) \bowtie Catalog)$

R2 = $(\sigma_{color='green'}(Parts) \bowtie Catalog))$

R3 = Π_{sid} (R1 ∪ R2)

iii. $\Pi_{sid}((\sigma_{color='red'}(Parts) \bowtie Catalog) \cup (\sigma_{address='1065\ Military\ Trail'}(Suppliers) \bowtie Catalog))$

iv. R1 = $(\Pi_{sid}(\sigma_{color='red'}(Parts) \bowtie Catalog)$

R2 = $(\Pi_{sid}(\sigma_{color='green'}(Parts) \bowtie Catalog)$

R3 = R1 ∩ R2

v. $\Pi_{sid,\ pid}(Parts \bowtie Catalog)/\Pi_{pid}(Parts)$

vi. R1 = $\Pi_{sid,\ pid}(Catalog)$

R2 = $\Pi_{pid}(\sigma_{color='red'}(Parts))$

R3 = R1/R2

vii. $\Pi_{sid,\ pid}(Catalog)/(\Pi_{pid}(\sigma_{color='red'}(Parts)) \cup \Pi_{pid}(\sigma_{color='green'}(Parts)))$

viii. $R1 = (\Pi_{sid,\ pid}(Catalog))/(\Pi_{pid}(\sigma_{color='red'}(Parts))$

$R2 = (\Pi_{sid,\ pid}(Catalog))/(\Pi_{pid}(\sigma_{color='green'}(Parts))$

$R3 = R1 \cup R2$

ix. $R1 = \Pi_{sid,\ pid,\ cost}((Parts \bowtie Catalog) \bowtie Suppliers)$

$R2 = \rho_{R2(sid2,\ pid2,\ cost2)}(R1)$

$R3 = R1 \bowtie_{cost > cost2\ AND\ pid = pid2} R2$

$R4 = \Pi_{pid,\ pid2}(R3)$

x. $R1 = \Pi_{sid,\ pid}(Catalog)$

$R2 = \rho_{R2}(R1)$

$R3 = R1 \bowtie_{R1.pid = R2.pid\ AND\ R1.sid! = R2.sid} R2$

$R4 = \Pi_{R1.pid}(R3)$

xi. $R1 = \Pi_{pid,\ cost}(Parts \bowtie Catalog \bowtie \sigma_{sname='Canada\ Suppliers'}(Suppliers))$

$R2 = \rho_{R2(pid2,\ cost2)}(R1)$

$R3 = \Pi_{pid,\ cost}(R1 \bowtie_{cost < cost2} R2)$

$R4 = \Pi_{pid}(R1 - R3)$

xii. $R1 = \Pi_{pid,\ sid}(\sigma_{cost < 200}(Catalog))$

$R2 = \Pi_{sid}(Suppliers)$

$R3 = R1/R2$