1. (a) See txt file
   (b) See txt file
   (c) See txt file
   (d) See txt file
   (e) $\rho(temp, (Sells \bowtie_{Sells.iid=Item.iid} Item) \bowtie_{storeid} (Sells \bowtie_{Sells.iid=Item.iid} Item))$
   $\rho(temp1, temp \bowtie_{storeid} temp)$
   $\rho(tempf(2 \rightarrow iid1, 4 \rightarrow color1, 5 \rightarrow iid2, 7 \rightarrow color2, 8 \rightarrow iid3, 10 \rightarrow color3, 11 \rightarrow iid4, 13 \rightarrow color4), temp1)$
   $\rho(check1, \sigma_{color1 \neq color2 \neq color3 \neq color4} tempf)$
   $\rho(check2, \sigma_{color1 \neq color2 \neq color3}(\pi_{storeid,color1,color2,color3} tempf))$
   $\rho(ans, \pi_{storeid}(check2) - \pi_{storeid}(check1))$
   Table ans is our final result
   (f) Sells S1 and Sells S2
   $\rho(temp1, \pi_{iid}(\sigma_{storeid=S2.storeid} Sells))$
   $\rho(temp2, \pi_{storeid}(\sigma_{iid=temp1.storeid} Sells))$
   $\rho(temp3, \pi_{S1.storeid,S2.storeid}(\sigma_{S1.storeid \neq temp2.storeid}(S1 \times S2)))$
   $\rho(temp4(1 \rightarrow storeid1, 2 \rightarrow storeid2), temp3)$
   $\rho(ans, \pi_{storeid1,storeid2}(\sigma_{storeid1 > storeid2} temp4))$
   Table ans is our final result
   (g) $\rho(sells2, sells)$
   $\rho(cross, sells2 \times sells)$
   $\rho(cross2(1 \rightarrow iid1, 2 \rightarrow storeid1, 3 \rightarrow price1, 4 \rightarrow iid2, 5 \rightarrow storeid2, 6 \rightarrow price2), cross)$
   $\rho(notmin1, \sigma_{price2 > price1 \wedge iid2=iid1 \wedge storeid2 \neq storeid1} cross2)$
   $\rho(notmin2, \pi_{iid2,storeid2,price2} notmin1)$
   $\rho(ans, Sells - notmin2)$
   Table ans is our final result

2. see txt file

3. (a) True
   $\delta(\sigma_C(R)) \equiv \sigma_C(\delta(R))$
   LHS
   $\delta(\sigma_C(R)) \equiv \{t \in R \mid$ c is true for t $\}$
   $\sigma_C(R) \equiv \{kt \in R \mid$ k is the multiplicity of t and c is true for t $\}$
   $R \equiv \{kt \in R \mid$ k is the multiplicity for t $\}$
   RHS:
   $\sigma_C(\delta(R)) \equiv \{t \in R \mid$ where c is true for t $\}$
   $\delta(R) \equiv \{kt \in R \mid$ k is the multiplicity for t $\}$
   $R \equiv \{kt \in R \mid$ k is the multiplicity for t $\}$
   $LHS \equiv RHS$
   (b) True
   $\delta(\pi_A(R)) \equiv \pi_A(\delta(R))$
   LHS:
   $\delta(\pi_A(R)) \equiv \{t[A] \mid t \in R\}$
   $\pi_A(R) \equiv \{kt[A] \mid kt \in R \mid$ k is the multiplicity of t $\}$
   $R \equiv \{kt \in R \mid$ k is the multiplicity of t$\}$
   RHS:

$\pi_A(\delta(R)) \equiv \{t[A] \mid t \in R\}$

$delta(R) \equiv \{t \in R\}$
$R \equiv \{kt \in R \mid$ k is the multiplicity of t$\}$
$LHS \equiv RHS$

(c) True
$\delta(R \times S) \equiv \delta(R) \times \delta(S)$
LHS:
$\delta(R \times S) \equiv \{r \cdot s \mid r \in R \wedge s \in S\}$
$R \times S \equiv \{k(r \cdot s) \mid r \in R \wedge s \in S \wedge$ k is the multiplicity of $(r \cdot s)\}$
RHS:
$\delta(R) \times \delta(S) \equiv \{r \cdot s \mid r \in R \wedge s \in S\}$
$R \times \delta(S) \equiv \{m(r) \cdot s \mid r \in R \wedge s \in S \wedge$ m is the multiplicity of r$\}$
$R \times S \equiv \{m(r) \cdot n(s) \mid r \in R \wedge s \in S \wedge$ m is the multiplicity of r and n is the multiplicity of s$\}$
$R \times S \equiv \{k(r \cdot s) \mid r \in R \wedge s \in S \wedge$ k=mn is the multiplicity of $(r \cdot s)\}$
$LHS \equiv RHS$

(d) True
$\delta(R \bowtie_C S) \equiv \delta(R) \bowtie_C \delta(S)$
LHS:
$\delta(R \bowtie_C S) \equiv \delta(\sigma_C(R \times S))$
$\delta(\sigma_C(R \times S)) \equiv \{r \cdot s \mid r \in R \wedge s \in S \wedge$ c is true for $r \cdot s\}$
$\sigma_C(R \times S) \equiv \{k(r \cdot s) \mid r \in R \wedge s \in S \wedge$ c is true for $r \cdot s \wedge$ k is the multiplictity of $r \cdot s\}$
$R \times S \equiv \{k(r \cdot s) \mid r \in R \wedge s \in S \wedge$ k=mn is the multiplicity of $(r \cdot s)\}$
RHS:
$\delta(R) \bowtie_C \delta(S) \equiv \{r \cdot s \mid r \in R \wedge s \in S \wedge$ c is true for $r \cdot s\}$
$R \bowtie_C \delta(S) \equiv \{m(r) \cdot s \mid r \in R \wedge s \in S \wedge$ c is true for $m(r) \cdot s \wedge$ m is the multiplicity of r$\}$
$R \bowtie_C S \equiv \{m(r) \cdot n(s) \mid r \in R \wedge s \in S \wedge$ c is true for $m(r) \cdot s \wedge$ m is the multiplicity of r and n is the multiplicity of s$\}$
$R \bowtie_C S \equiv \{k(r \cdot s) \mid r \in R \wedge s \in S \wedge$c is true for $k(r \cdot s) \wedge$ k=mn is the multiplicity of $(r \cdot s)\}$
$R \bowtie_C S \equiv \sigma_C(R \times S)$
$\sigma_C(R \times S) \equiv \{k(r \cdot s) \mid r \in R \wedge s \in S \wedge$c is true for $k(r \cdot s) \wedge$ k=mn is the multiplicity of $(r \cdot s)\}$
$R \times S \equiv \{k(r \cdot s) \mid r \in R \wedge s \in S \wedge$ k=mn is the multiplicity of $(r \cdot s)\}$
$LHS \equiv RHS$

(e) False
$\delta(R \cup_B S) \neq \delta(R) \cup_B \delta(S)$
$R = \{(1,2),(1,2),(3,4)\}$ and $S = \{(1,2),(3,4),(3,4)\}$
LHS:
$R \cup_B S = \{1,2),(1,2),(1,2),(3,4),(3,4),(3,4)\}$
$\delta(R \cup_B S) = \{(1,2),(3,4)\}$
RHS:
$\delta(R) = \{(1,2),(3,4)\}$ and $\delta(S) = \{(1,2),(3,4)\}$
$\delta(R) \cup_B \delta(S) = \{(1,2),(1,2),(3,4),(3,4)\}$
$LHS \neq RHS$ so this is false

(f) True
LHS:
$\delta(R \cap_B S) \equiv \delta(R) \cap_B \delta(S)$
$\delta(R \cap_B S) \equiv \{t \in R \vee t \in S \mid$ t occurs in both R and S$\}$
$R \cap_B S \equiv \{kt \in R \vee t \in S$ |t occurs in both R and S and k is the minimum number of occurrences of t in either R or S$\}$
RHS:
$\delta(R) \cap_B \delta(S) \equiv \{t \in R \vee t \in S \mid$ t occurs in both R and S$\}$
$R \cap_B \delta(S) \equiv \{mt \in R \vee t \in S$ |t occurs in both R and S and m is the amount of occurrense of t in R$\}$

$R \cap_B S \equiv \{mt \in R \vee nt \in S \mid$ t occurs in both R and S and m is the amount of occurrense of t in R and n is the n amount of occurences of t in S$\}$
$R \cap_B S \equiv \{kt \in R \vee t \in S \mid$t occurs in both R and S and k is the minimum number of occurrences of t in either R or S$\}$
$LHS \equiv RHS$

(g) False
$\delta(R -_B S) \equiv \delta(R) -_B \delta(S)$
$R = \{(1,2),(1,2),(3,4)\}$ and $S = \{(1,2),(3,4),(3,4)\}$
LHS:
$R -_B S = \{(1,2)\}$
$\delta(R -_B S) = \{(1,2)\}$
RHS:
$\delta(R) = \{(1,2),(3,4)\}$ and $\delta(S) = \{(1,2),(3,4)\}$
$\delta(R) -_B \delta(S) = \{\}$ empty set
$LHS \neq RHS$