Q1.

a) \[ \pi_{\text{title}}\left(\pi_{\text{bid}}(Orders) - \pi_{\text{bid}}\left(\sigma_{\text{quantity} < 100}(Orders)\right)\right) \bowtie Books \]

b) \[ \pi_{\text{author}}\left((\sigma_{\text{price} \leq 400}(Books) \bowtie Orders) \bowtie (\sigma_{\text{zipcode} = 12345}(Customers))\right) \]

c) \[ \pi_{\text{cname}}\left(\left(\pi_{\text{cid}}((\sigma_{\text{year} = 2000}(Books) \bowtie Orders) \cap \pi_{\text{cid}}\left(\sigma_{\text{quantity} \geq 100} \land \text{price} > 100}(Books \bowtie Orders)\right)\right) \bowtie Customers\right) \]

d) \[ \rho(TMP1,Orders) \]
\[ \rho(TMP2,TMP1) \]
\[ \rho(TMP3,\pi_{\text{TMP1.bid}}(TMP1 \bowtie (\pi_{\text{bid}}(TMP1.bid = TMP2.bid) \cap (\sigma_{\text{TMP1.cid} < \text{TMP2.cid}}) TMP2))) \]
\[ \pi_{\text{author}}(TMP3 \bowtie Books) \]

e) \[ \rho(TMP1,Customers) \]
\[ \rho(TMP2,TMP1) \]
\[ \rho(\text{twoormore},\pi_{\text{TMP1.cid}}(TMP1 \bowtie (\pi_{\text{bid}}(\text{TMP1.cid} < \text{TMP2.cid}) \cap (\sigma_{\text{TMP1.zipcode} = \text{TMP2.zipcode}}) TMP2))) \]
\[ \pi_{\text{title}}\left((\pi_{\text{cid}}(Customers) - \pi_{\text{cid}}(\text{twoormore}) \bowtie Orders \bowtie Books)\right) \]
Q2.

a)  
SELECT B.AUTHOR  
FROM BOOKS B, ORDERS O  
WHERE B.BID=O.BID AND B.BID NOT IN (  
    SELECT O1.BID  
    FROM ORDERS O1, CUSTOMERS C  
    WHERE O1.CID=C.CID AND C.ZIPCODE <> '02125'  
)  

b)  
SELECT C.zipcode  
FROM Books B, Orders O, Customers C  
WHERE B.bid=O.bid and C.cid=O.cid and O.quantity >=10 and B.author LIKE “Cod%”

c)  
SELECT C.cname, MAX(B.price)  
FROM Orders O, Books B, Customer C  
WHERE C.cid=O.cid and O.bid=B.bid and B.year=1990  
GROUP BY C.cid, C.cname  
HAVING 5 <= (SELECT COUNT(*) FROM ORDERS O1, BOOKS B1  
    WHERE O1.BID=B1.BID AND O1.CID=C.CID)
d)
SELECT B.btitle
FROM Books B WHERE NOT EXISTS(
    SELECT C.zipcode from Customers C
    MINUS
    SELECT C1.zipcode FROM Orders O, Customers C1
    WHERE C1.cid=O.cid and O.bid=B.bid
)


f)
SELECT  TMP.zip
FROM    (SELECT C.zipcode AS zip, SUM (O.quantity * B.price) AS TotalAmount
         FROM Customers C, Orders O, Books B
         WHERE O.bid=B.bid and C.cid=O.cid and C.zipcode='02125'
         GROUP BY C.zipcode
         ) TMP
WHERE TMP.TotalAmount = (SELECT MAX(TotalAmount) FROM TMP)