TPC-H

1- SELECT c_name
 FROM customer
 WHERE c_acctbal > 9000 AND c_mktsegment = 'HOUSEHOLD';

2- SELECT DISTINCT p_partkey, p_name
 FROM part, partsupp, supplier, nation, region
 WHERE p_partkey = ps_partkey AND ps_suppkey = s_suppkey AND s_nationkey = n_nationkey
 AND n_regionkey = r_regionkey AND r_name = 'MIDDLE EAST'
 ORDER BY p_partkey;

3- SELECT COUNT(DISTINCT ps_partkey)
 FROM partsupp, supplier, nation, region
 WHERE ps_suppkey = s_suppkey AND s_nationkey = n_nationkey AND n_regionkey = r_regionkey
 AND r_name = 'EUROPE'

4- (SELECT p_partkey, p_partname FROM part)
 EXCEPT
 (SELECT p_partkey, p_partname FROM part, partsupp, supplier, nation, region WHERE
 ps_suppkey = s_suppkey AND s_nationkey = n_nationkey AND n_regionkey = r_regionkey
 AND r_name = 'EUROPE')

5- WITH custkeys AS ( 
 (SELECT c_custkey FROM customer)
 EXCEPT
 (SELECT c_custkey
 FROM lineitem, orders, customer, supplier, nation nc, nation ns
 WHERE l_orderkey = o_orderkey AND o_custkey = c_custkey AND c_nationkey = nc.n_nationkey
 AND nc.n_regionkey <> ns.n_regionkey AND l_suppkey = s_suppkey AND s_nationkey = ns.n_nationkey)
 )

 SELECT DISTINCT c_name, c_phone, r_name
 FROM custkeys, customer, nation, region
 WHERE custkeys.c_custkey = customer.c_custkey AND c_nationkey = n_nationkey AND 
n_regionkey = r_regionkey
6- SELECT MAX(l._extendedprice)
    FROM lineitem
    WHERE l._discount > l._tax

7- WITH timelyorders AS (
    (SELECT DISTINCT o_orderkey AS orderkey
     FROM orders)
    EXCEPT
    (SELECT DISTINCT l_orderkey AS orderkey
     FROM lineitem
     WHERE DATEDIFF(day, l_shipdate, l_receiptdate) > 14)
 )

    SELECT COUNT(orderkey) FROM timelyorders;

8- WITH requiredcustomers AS (
    (SELECT c_custkey FROM customer)
    EXCEPT
    (SELECT DISTINCT o_custkey
     FROM lineitem, orders, supplier, nation
     WHERE l_orderkey = o_orderkey AND l_suppkey = s_suppkey AND s_nationkey = n_nationkey
     AND n_name = 'UNITED STATES')
 )

    SELECT COUNT(*) FROM requiredcustomers;

9- SELECT n_name
    FROM customer, nation
    WHERE c_acctbal = (SELECT MAX(c_acctbal) FROM customer) AND c_nationkey = n_nationkey;

10- SELECT DISTINCT n_name
    FROM lineitem, orders, customer, supplier, nation
    WHERE l_orderkey = o_orderkey AND o_custkey = c_custkey AND c_nationkey = n_nationkey
    AND l_suppkey = s_suppkey
    AND s_nationkey = c_nationkey
    AND DATEDIFF(day, l_shipdate, l_receiptdate) > 29
11- (SELECT artistId, name FROM artist)
   EXCEPT
   (SELECT artist.artistId, artist.name FROM artist, album WHERE artist.artistId = album.artistId)

12- (SELECT artistId, name FROM artist)
   EXCEPT
   (SELECT artist.artistId, artist.name
    FROM artist, album, track, genre
    WHERE artist.artistId = album.artistId AND album.albumId = track.albumId AND track.genreId =
    genre.genreId AND genre.name = 'Latin')

13- SELECT trackId, track.name
    FROM track, mediaType
    WHERE milliseconds =
    (SELECT MAX(milliseconds) FROM track, mediaTypeId
     WHERE track.mediaTypeId = mediaType.mediaTypeId AND mediaType.name LIKE '%video%')
    AND track.mediaTypeId = mediaType.mediaTypeId AND mediaType.name LIKE '%video%';

14- SELECT firstname, lastname
    FROM customer
    WHERE city = (SELECT city FROM employee WHERE reportsTo IS NULL);

15- WITH managersOfSuppBraz AS (
    SELECT DISTINCT reportsTo AS manId
    FROM employee, customer
    WHERE employeeld = supportRepld AND customer.country = 'Brazil')

    SELECT employeeld, firstname, lastname
    FROM employee e, managersOfSuppBraz m
    WHERE e.employeeld = m.manId

16- SELECT COUNT(t.trackId), SUM(l.unitprice)
    FROM invoiceLine l, invoice i, customer c, track t, mediaType m
    WHERE l.invoiceld = i.invoiceld AND i.customerId = c.customerId AND c.country = 'Germany'
    AND t.trackId = l.trackId AND t.mediaTypeId = m.mediaTypeId AND m.name LIKE '%audio%'

17- (SELECT playlistId, name FROM playlist)
   EXCEPT
   (SELECT p.playlistId, p.name
    FROM playlist p, playlistTrack pt, track t, genre g
WHERE p.playListId = pt.playListId AND pt.trackId = t.trackId AND t.genreId = g.genreId AND g.name = 'Latin')

18- SELECT SUM(bytes), SUM(unitprice)
    FROM playlist p, playlistTrack pt, track t
    WHERE p.name = 'Grunge' AND p.playListId = pt.playListId AND pt.trackId = t.trackId

19- (SELECT playlistId, name FROM playlist)
    EXCEPT
    (SELECT p.playlistId, p.name
    FROM playlist p, playlistTrack pt, track t, album b, artist a
    WHERE p.playlistId = pt.playlistId AND pt.trackId = t.trackId AND t.albumId = b.albumId AND
    b.artistId = a.artistId AND (a.name = 'Black Sabbath' OR a.name = 'Chico Buarque'))

20- SELECT c.name, c.country
    FROM customer c, employee e
    WHERE c.supportRepId = e.employeeId AND DATEDIFF(year, birthdate, hiredate) < 35

RELATIONAL ALGEBRA

Q1) $\pi_{c.name}(\sigma_{acctbal=9000\land mktSegment = 'HOUSEHOLD'}(customer))$

Q2) $\pi_{p.partkey,p.name\sigma_{r.name='MIDDLE EAST'}}(\quad
tpartialsupp \bowtie_{ps_suppkey=s_suppkey} partial \bowtie_{p_partkey=ps_partkey}(\quad
supplier \bowtie_{s_nationkey=n_nationkey}(nation \bowtie_{n_regionkey=r_regionkey} region))$

Q4) $\pi_{p.partkey,p.name}(part) - (\quad
tpartialsupp \bowtie_{ps_suppkey=s_suppkey} partial \bowtie_{p_partkey=ps_partkey}(\quad
supplier \bowtie_{s_nationkey=n_nationkey}(nation \bowtie_{n_regionkey=r_regionkey} region))$

Q5) $s = supplier \bowtie_{s_nationkey=n_nationkey} p(nation, ns)$
    $c = customer \bowtie_{c_nationkey=n_nationkey} p(nation, nc)$
    $l = c \bowtie_{c_custkey=o_custkey} orders \bowtie_{o_orderkey=l_orderkey} lineitem \bowtie_{l_suppkey=s_suppkey}$
    $k = \pi_{c_custkey(customer) - \pi_{c_custkey}(\sigma_{nc\_nationkey\neq ns.n_nationkey}(l))}$
    $\pi_{c.name,c.phone,c.name}(k \bowtie customer \bowtie_{c_nationkey=n_nationkey}(nation \bowtie_{n_regionkey=r_regionkey} region))$

Q10) $t = lineitem \bowtie_{l.orderkey=o.orderkey} orders \bowtie_{o_custkey=c_custkey} customer$
     $\bowtie_{l_suppkey=s_suppkey} n_nationkey \bowtie supplier \bowtie_{c_nationkey=n_nationkey} nation$
     $\pi_{n.name}(\sigma_{DATEDIFF(day, l.shipdate, l_receiptdate) > 29}(t))$

Q11) $\pi_{artistId(artist) - \pi_{artist.artistId, artist.name}(artist \bowtie album)$
Q14) $\pi_{\text{firstname, lastname}}(\sigma_{\text{ISNULL(reportsTo)}}(\text{customer} \bowtie_{\text{customer.city}=\text{employee.city}} \text{employee}))$

Q15) $mbraz = \pi_{\text{reportsTo}}(\sigma_{\text{customer.country='Brazil'}}(\text{customer} \bowtie_{\text{supportRepId=employeeId}} \text{employee}))$

$\pi_{\text{employeeId, firstname, lastname}}(\text{employee} \bowtie_{\text{employeeId=mbraz.reportsTo}} \text{mbraz})$

Q20) $\pi_{c.\text{firstname}, c.\text{lastname}, c.\text{country}}(\sigma_{\text{DATEDIFF(year, birthday, hiredate)<35}}(\rho(\text{customer}, c) \bowtie_{\text{supportRepId=employeeId}} \rho(\text{employee}, c)))$

Note: Full list of RA-expressible queries

1, 2, 4, 5, 10
11, 12, 14, 15, 17, 19, 20