1. (a)   SELECT   person-name
         FROM   Work
         WHERE   salary < 20000

(b) $\Pi_{person-name}(\sigma_{salary < 20000}(Work))$

(C)   (a) and (b) are not same because (a) can have duplicates while (b) can't. (i.e. (a) uses bag semantics while (b) uses set semantics)

2. (a) SELECT person-name

FROM   Work

GROUP BY person-name

HAVING SUM(salary) > ALL (

    SELECT SUM(salary)

    FROM   Work

    JOIN   Employee

     ON   Work.person-name = Employee.person-name

    WHERE   Employee.city = 'Los Angeles'

    GROUP BY Employee.person-name

)

(b) SELECT manager-name

FROM Manage AS M1

JOIN Work AS W1

WHERE manager-name = W1.person-name

GROUP BY manager-name

HAVING EXISTS (

SELECT *

FROM Manage AS M2

JOIN Work AS W2

ON M2.person-name = W2.person-name

WHERE M2.manager-name = M1.manager-name

GROUP BY M2.person-name

HAVING SUM(W2.salary) < SUM(W1.salary)

)

3.(a)(i)
```
SELECT   name, address
FROM   Movie Star
WHERE   gender = 'F'
INTERSECT
SELECT   name, address
FROM   Movie Exec
WHERE   net Worth > 1 000 000
```

(ii)
```
SELECT   MovieStar.name, MovieStar.address
FROM   Movie Star
JOIN   Movie Exec
ON      Movie Star.name = Movie Exec.name
        AND Movie Star.address = Movie Exec.address
WHERE   gender = 'F'
        AND net Worth > 1 000 000
```

(b) (i) SELECT name
         FROM Movie Star
         EXCEPT
         SELECT name
         FROM Movie Exec

(ii) SELECT MovieStar.name
      FROM Movie Star
      LEFT JOIN Movie Exec
      ON Movie Star.name = Movie Exec.name
      WHERE Movie Exec.name IS NULL

4. (a) SELECT AVG (speed)
       FROM Desktop

   (b) SELECT AVG (price)
       FROM Computer Product
       JOIN Laptop
          ON Computer Product . model = Laptop . model
       WHERE weight < 2

   (c) SELECT AVG (price)
       FROM Computer Product
       WHERE manufacture = 'Dell'

   (d) SELECT speed , AVG (price)
       FROM Computer Product
       JOIN Laptop
          ON Computer Product . model = Laptop . model
       GROUP BY speed .

(e) SELECT manufacture

FROM Computer Product

GROUP BY manufacture

HAVING COUNT(*) >= 3

5. (a)
```sql
INSERT INTO ComputerProduct (manufacture, model, price)
VALUES ("HP", "1200", 1000);

INSERT INTO Desktop (model, speed, ram, hdd)
VALUES ("1200", 1.2, 256, 80)
```

(b)
```sql
DELETE FROM Desktop
WHERE model IN (
    SELECT model
    FROM ComputerProduct
    WHERE manufacture = 'IBM'
        AND price < 1000
)

DELETE FROM ComputerProduct
WHERE manufacture = 'IBM'
    AND price < 1000
    AND model NOT IN (
        SELECT model
        FROM Laptop
    )
```

(c) UPDATE Laptop

    SET weight = weight + 1

    WHERE model IN (

        SELECT model

        FROM Computer Product

        WHERE manufacture = 'Gateway'

)

6. (a) SELECT sid
       FROM Enroll
       WHERE sid NOT IN (
           SELEC sid
           FROM Enroll
           WHERE dept != 'CS'
)

   (b) SELECT sid
       FROM Enroll
       WHERE sid NOT IN (
           SELECT E1.sid
           FROM Enroll AS E1
           JOIN Enroll AS E2
           WHERE E2.dept = 'CS'
           AND (E1.sid, E2.dept, E2.cnum) NOT IN (
               SELECT sid, dept, cnum
               FROM Enroll
               WHERE dept = 'CS'
)
)

(c)   SELECT sid

 FROM Enroll

 WHERE dept = 'cs'

 GROUP BY sid

 HAVING COUNT(*) = (

   SELECT COUNT(DISTINCT cnum)

   FROM Enroll

   WHERE dept = 'cs'

)