**Question 1**

1. δ(δ(R)) = δ(R)  YES
2. ΠL(ΠL(R)) = ΠL(R), where L = a set of attributes  YES
3. ΠK(ΠL(R)) = ΠK,L(R), where K, L = sets of attributes  NO
4. σC(σC(R)) = σC(R), where C = a condition  YES
5. γL, agg(A)(γL, agg(A)(R)) = γL, agg(A)(R), where L = a set of NO

group-by attributes, agg is an aggregate operator,

and A is an attribute

**Question 2**

a) Πz.word,cnt (γz.wid, z.word, count(\*) -> cnt ((Occurs y ⋈σy.wid=z.wid Word z)⋈ σx.did=y.did Doc x))

b) Πdid, docTitle (Doc x ⋈σx.did !=did  (Keyword u ⋈σu.word !=z.word (Occurs y ⋈σy.wid=z.wid Word z)))

**Question 3**

1) select eid, name from employee

where eid in (select manger.eid from manager

group by manager.eid

having count(mid)>=2)

Πeid, name (employee ⋈ σmanager.eid=employee.eid Πz.word, cnt >=2 (γeid, count(\*) -> cnt (manager)))

2) select eid, name from employee

where eid not in (select manger.eid from manager)

Πeid, name (employee ⋈ σeid=eid (Πeid (employee) - Πeid (manager))

3) select m.mid from manager m, employee e

where e.eid = m.eid and e.name = 'Alice'

Πmid (employee e ⋈ σe.eid=m.eid, e.name=’Alice’ manager m)