1. a) From the table we can determine the following:

B->C

B->D

B->A

C->D

D->C

Therefore B->ABCD since B includes all of r’s attributes we can determine B is the key.

b) There is unique value mapping between C and D. This shows C is functional dependent to D therefore C->D is satisfied.

c) There is not unique value mapping between C and B. This shows C is not functionally dependent to B therefore C->B is not satisfied.

d) There is unique value mapping between B and A, B and C, and B and D. This shows B is functionally dependent to A, C, and D therefore B->ACD is satisfied.

2. a) (AG)+ = {AGBCDEF} so AG->BDF is possible

b) B+ = {BCDEF}

c) (AG)+ = {AGBCDEF} therefore AG is a key.

3. a) A->B B->C => A->C

Final Result: A->C

b) ABCD->C, ABCD->D, ABCD->E, ABCD->F

ABD->C, ABC->D

Final Result: ABD->C, ABC->D, ABCD->E, ABCD->F

c) A->A, A->B, A->C, C->D

A->C C->D => A->D

Final Result: A->B, A->D

d) AB->C, AB->D, A->B, B->C

A->B B->C => A->C

Final Result: AB->C, AB->D, A->C

e) A->B, ABCD->E, EF->G, EF->H, ACDF->E, ACDF->G

Final Result: A->B, ABCD->E, EF->G, EF->H, ACDF->E, ACDF->G

4. a) False

b) True

YZ->Y

X->YZ YZ->Y => X->Y

c) False

Tuple 1: w=1 x=2 y=3 z=4

Tuple 2: w=1 x=2 y=2 z=4

The tuples above satisfy X->YZ and Y->W but do not satisfy Y->Z

5. a) B+ = {B,A,C,D} so B is the only key

b) AB

c) B

d) BA->B

e) Yes because it easy to figure out what the dependencies are within the relational database.

f) The functional dependencies in both databases are B->ABCD and C->D, there fore there are no examples that satisfy r and do not satisfy R.

6. a) C+= {C, D, A}

R1 = {C, D, A}

R2= {C, B}

C->D, D->A, A->B

b) Yes

c) There is not a 3NF violation

d) It is already 3NF