Himanshu Mehta and Ryan Moore

1.
    a. R(A,B,C,D) with FD's AB → C, C → D, D → A , B → D
        i. Find BCNF violations
            1. AB+ = {A,B,C,D}, Superkey!
            2. C+ = {C,D,A} BCNF violation
            3. D+ = {D,A} BCNF violation
            4. B+ = {B,D,A} BCNF violation
        ii. Decompose!
            1. C+ = {C,D,A} BCNF violation
            2. Decompose into R1 = {C,D,A} and R2 = {C,B}
            3. Find FDs in R1 { C → D, C → A, D → A }, R2 {}
            4. R2 is in BCNF
            5. C+ = {C,D,A} BCNF violation, D+ = {D,A} BCNF violation decompose R1 into {D,A}, {D,C}
            6. Decomposition: {D,A}, {D,C} {C,B}

    b. R(A,B,C,D) with FD's B → C, B → D, A → B
        i. Find BCNF violations
            1. B+ = {B,C,D} BCNF violation
            2. A+ = {A,B,C,D} Superkey!
        ii. Decompose!
            1. B+ = {B,C,D} BCNF violation
            2. Decompose into R1 = {B,C,D} and R2 = {B,A}
            3. Find FDs in R1 { B → C, B → D R2 {}
            4. R2 is in BCNF
            5. B+ = {B,C,D}, left sides of FDs are superkeys
            6. Decomposition: {B,C,D}, {B,A}
2. R(A,B,C,D,E) is decomposed into R1(A,B,C), R2(B,C,D), R3(A,C,E)

	a	b	c	d	e
r1	a	b	c	d1	e1
r2	a2	b	c	d	e2
r3	a	b3	c	d3	e

a. B → E and CE → A
    1. Apply CE → A and B → to table
    2.

	a	b	c	d	e
r1	a	b	c	d1	e1
r2	a2	b	c	d	e1
r3	a	b3	c	d3	e

    3. Not lossless because there is no row without a subscript

b. AC → E and BC → D
    1. Apply AC → E, and BC → D
    2.

	a	b	c	d	e
r1	a	b	c	d	e
r2	a2	b	c	d	e1
r3	a	b3	c	d3	e

    3. Lossless because r1 has no subscripts

3. R(A,B,C)
   Given MVD A →→ B and tuples (a1,b1,c1),(a, b2, b2),(a,b3,c3)
   Other tuples in R include (a,b1,c2), (a,b1,c2),(a,b1,c3), (a,b2,c1),(a,b2,c3), (a,b3,c1),(a,b3,c2). We know they are in the current instance of R because they are the remaining combinations that can be made with the given tuples.

4. Imagine you are tasked with coming up with a new Virtual Reality Movie Website. VR movies can be 180, 360 with or without 3D. People might want to have accounts to comment on Movies. Make an E/R diagram that might be suitable for the database of such a site and include it in your Hw3.pdf.