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Database Systems
Homework 2

3.2.7
Proof by contradiction: if $(X^+)^+ \neq X^+$, then it means that in $(X^+)^+$ there is some FD not included that would make the answer X^+. But by definition the closure of X would contain this FD, so if $(X^+)^+$ does not equal X^+, there is a contradiction. Therefore, $(X^+)^+ = X^+$, otherwise the X^+ doesn't contain every FD, and isn't actually the closure of X.

3.3.1 b)
i)
BCNF violations: B -> C and B -> D are both BCNF violations, because B^+ doesn't include all attributes of R. It doesn't cover A.

ii)
A possible decomposition is: R(A,B), R(B,C,D).

3.5.1 b)
i)
3NF violations: B->C and B->D are both 3NF violations because B isn't a superkey, and C and D aren't prime.
ii)
A possible decomposition is: R(A,B), R(B,C), R(B,D).