7.

a) False

  i) CounterExample. The knowledge base does not entail P(P(A)), P(P(P(A)))) and so on.

b) True

  i) Since any x or y is equal to itself, we know that for every variable, there exists another variable, itself, that it is equal to.

8.

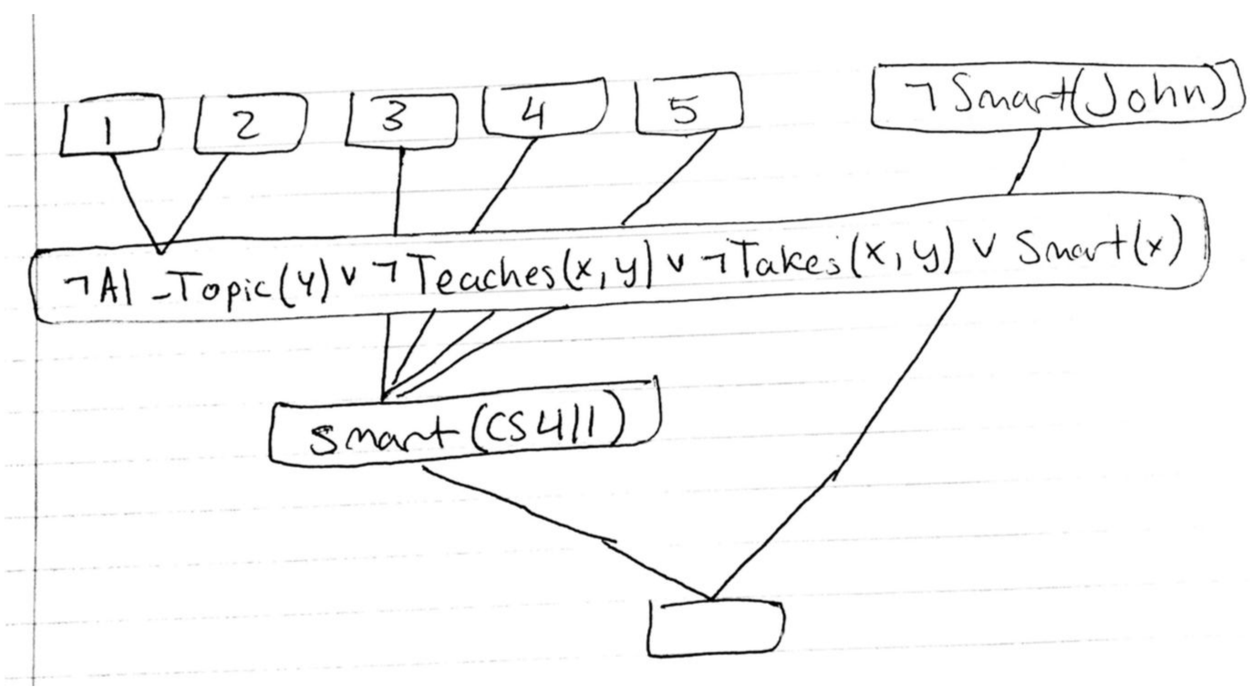
a)

1. $(\forall x \forall y)$ AI_Course(y) ^ Takes(x, y) => Smart(x)
2. $(\forall x \forall y)$ AI_Topic(y) ^ Teaches(x, y) => AI_course(x)
3. $(\exists x \exists y)$ Takes(John, CS411)
4. $(\exists x \exists y)$ Teaches(CS411, Inference)
5. $(\exists x)$ AI_Topic(Inference)

b)

1. $(\forall x \forall y)$ ¬ AI_Course(x) v ¬ Takes(x, y) v Smart(x)
2. $(\forall x \forall y)$ ¬ AI_Topic(y) v ¬ Teaches(x, y) v AI_Course(x)
3. $(\exists x \exists y)$ Takes(John, CS411)
4. $(\exists x \exists y)$ Teaches(CS411, Inference)
5. $(\exists x)$ AI_Topic(Inference)

c)



9. (.85 * .6) + (.15 * .4) = 57%

10.
  a) False
     i) P(x=1) + P(x=1) = .5
  b) True
     Since each individual combo probability is ¼ , and each P(X|Y) combination will always be ½, the statement holds true.
  c) False
     If both X and Y were similar to begin with and were dependent of each other on the same way then the statement would still hold true although they are dependent of one another
  d) False
     We would need the marginal for Y since they may not have equal weight or probability of each outcome given with the conditionals.

11.