Tutorial 9 – Resolution method in FOL

Exercise 1: For the following arguments, decide whether they are valid using Resolution method.

a) Who knows Paul and Mary, pities Mary.
Some do not pity Mary, though they know her.

Some one knows Mary but not Paul.

b) All the board members are bondholders or shareholders.
No board member is both a bondholder and a shareholder.
All bondholders are members of the board.

No bondholder is a shareholder.

c) Anyone who likes George will work with Milan.
Milan's not friends with anyone who's friends with Lada.
Peter will only work with Karl's friends.

If Karel is a friend of Lada, then Peter doesn't like George.

d) Every man likes football and beer.
Karl only likes people who like football and beer.
Some people like football and don't like beer.
Who is not a man is a woman.

Some women Karel doesn't like.

Exercise 2: For the following formulas, decide whether they are logically valid using Resolution method:

a) $\forall x[\exists y Q(x,y) \vee \forall z \neg Q(x,z)]$

b) $\forall x[(\neg P(x) \vee Q(x,h(x))) \wedge \neg P(f(a))]$

c) $[\forall x \exists y P(x,y) \wedge \forall x(P(a,x) \supset Q(x))] \supset \exists x Q(x)$

d) $[\forall x(L(x) \supset \neg S(x)) \wedge \exists x(L(x) \wedge P(x))] \supset \exists x(P(x) \wedge \neg S(x))$

e) $\forall x[[(P(x,a) \wedge P(x,b)) \supset Q(x,b)] \wedge \exists x(\neg Q(x,b) \wedge P(x,b))] \supset \exists x(P(x,b) \wedge \neg P(x,a))$