I) ***Prove by resolution method*** that the following formulas are logically valid**:**

1) $\exists x \forall y\, P(x,y) \supset \forall y \exists x\, P(x,y)$
2) $\exists x\, [P(x) \wedge Q(x)] \supset [\exists x\, P(x) \wedge \exists x\, Q(x)]$
3) $[\forall x\, P(x) \vee \forall x\, Q(x)] \supset \forall x\, [P(x) \vee Q(x)]$

Hints:

First, *negate* the formula.

Second, Transform the negated formula into Skolem clausal form, in particular, eliminate existential quantifiers $\exists$.

Third, write down particular clauses and by using proper substitutions of *terms for variables* unify opposite literals so that to apply the resolution rule as long as you obtain an empty clause (contradiction).

II) ***Using resolution method***, *prove the validity of the argument*:

Every man likes something.
No misanthrope likes anything.
Jack is a man.

Some are not misanthropes.

Hints:

First, *formalize* premises and the conclusion.

Second, *negate* the conclusion.

Third, transform each of the so-obtained formulas into Skolem clausal form.

Third, write down particular clauses and by using proper substitutions of *terms for variables* unify opposite literals so that to apply the resolution rule as long as you obtain an empty clause (contradiction).