Exercise 7.1
Starting from the predicate $loves/2$, and the domain $\{Romeo, Juliet\}$, draw the subsumption lattice (without variable renaming).

Exercise 7.2
Transform the following formula into Skolem Normal Form (SNF):
$$\neg\forall z[\forall x \exists y Q(x, y, f(y, z)) \lor (\forall x \neg P(z, x)) \land (\exists y Q(z, y, g(y, z)))]$$

Exercise 7.3
Write down whether the following first-order predicate calculus sentences are correct representations of the corresponding English sentences:

1. Everybody has a mother. $\forall x Person(x) \Rightarrow (\exists y Mother(y, x))$
2. Fido is an old dog. $Old(Dog(Fido))$
3. All mathematical theories are true. $\forall x Math-Theory(x) \Rightarrow x$
4. Aristotle told a lie. $\exists s Aristotle-said(s) \land \neg True(s)$
5. There are no vegetarian butchers. $\exists v, b Butcher(b) \land Vegetarian(v)$

If you consider a representation to be incorrect, write down the correct representation.

Exercise 7.4

1. Write down a logical sentence such that every world in which it is true contains exactly one object.
2. Prove that $\forall x \exists y P(x, y)$ follows from $\exists y \forall x P(x, y)$ but not the other way round.

1 Please use the cover sheet from the home page to stitch all sheets together.