Theorem Proving and Equality

Use Otter and SPASS as a help in solving the following problems.

Exercise 7 *Formalize and prove using resolution and paramodulation:*

Mary's boyfriend is a student and he owns a car.
John is the only student who owns a car.
Therefore John is Mary's boyfriend.

Use the following functions and predicates:
$f(x)$ *- boyfriend of* x
$C(x)$ *-* x *owns a car*
$S(x)$ *-* x *is a student.*
You need also some constants!

Exercise 8 *Formalize and prove using resolution and paramodulation:*

Prof. Smith has only very good students at his lectures.
John and Mary attend the same lectures.
Mary attends Prof. Smith's lecture.
Therefore John is a very good student.

Exercise 9 *Formalize and prove using resolution and paramodulation:*

Every part is made either by manufacturer A or by manufacturer B.
All fragile parts are stored in the warehouse of their manufacturer.
Manufacturer B cannot manufacture titanium parts.
The part I need is fragile and made of titanium.
Therefore, the part I need is in the A's warehause.

Use the following functions and predicates:

$m(x)$ *- manufacturer of part* x*,*
$W(x, y)$ *- part* x *is stored in* y*'s warehause,*
$T(x)$ *- part* x *is made of titanium,*
$F(x)$ *- part* x *is fragile,*
a *- constant for "the part I need"*

Exercise 10 *Using resolution with paramodulation prove that left inverse is also the right inverse in a group theory.*

($e = f(x, i(x))$ follows from the axioms of group theory:
$f(f(x, y), z) = f(x, f(y, z))$
$f(e, x) = x$
$f(i(x), x) = e$*)*