Convert the following sentences into predicate and clausal normal form.

1. Every child loves Santa
2. Everyone who loves Santa loves any reindeer.
3. Rudolph is a reindeer, and Rudolph has a red nose.
4. Anything which has a red nose is weird or is a clown.
5. No reindeer is a clown.
6. Scrooge does not love anything which is weird.

1. Every child loves Santa.
   $\forall x\ (CHILD(x) \rightarrow LOVES(x,Santa))$
2. Everyone who loves Santa loves any reindeer.
   $\forall x, \forall y\ (LOVES(x,Santa) \wedge\ REINDEER(y) \rightarrow LOVES(x,y))$
3. Rudolph is a reindeer, and Rudolph has a red nose.
   $REINDEER(Rudolph) \wedge REDNOSE(Rudolph)$
4. Anything which has a red nose is weird or is a clown.
   $\forall x\ (REDNOSE(x) \rightarrow WEIRD(x) \vee CLOWN(x))$
5. No reindeer is a clown.
   $\neg\ \exists x\ (REINDEER(x) \wedge CLOWN(x))$
6. Scrooge does not love anything which is weird.
   $\forall x\ (WEIRD(x) \rightarrow \neg\ LOVES(Scrooge,x))$
7. (Conclusion) Scrooge is not a child.
   $\neg\ CHILD(Scrooge)$

1. Anyone whom Mary loves is a football star.
2. Any student who does not pass does not play.
3. John is a student.
4. Any student who does not study does not pass.
5. Anyone who does not play is not a football star.
6. (Conclusion) If John does not study, then Mary does not love John

1. Anyone whom Mary loves is a football star.
   $\forall x\ (LOVES(Mary,x) \rightarrow STAR(x))$
2. Any student who does not pass does not play.
   $\forall x\ (STUDENT(x) \wedge \neg\ PASS(x) \rightarrow \neg\ PLAY(x))$
3. John is a student.
   $STUDENT(John)$
4. Any student who does not study does not pass.
   $\forall x\ (STUDENT(x) \wedge \neg\ STUDY(x) \rightarrow \neg\ PASS(x))$
5. Anyone who does not play is not a football star.
   $\forall x\ (\neg\ PLAY(x) \rightarrow \neg\ STAR(x))$
6. (Conclusion) If John does not study, then Mary does not love John.
   $\neg\ STUDY(John) \rightarrow \neg\ LOVES(Mary,John)$

1. Anyone who rides a Harley is a rough character.
2. Every biker rides either Harley or bmw.
3. Anyone who rides a bmw is a yuppie.
4. Every yuppie is a lawyer.
5. Any nice girl does not date anyone who is a rough character.
6. Mary is a nice girl and John is a biker.
7. (Conclusion) If john is not a lawyer then mary doesnot date john.
   Prove the sentence using resolution.

1. $\forall x: rides(x,Harley) \rightarrow roughcharacter(x)$
2. $\forall x: biker(x) \rightarrow rides(x,Harley)\ V\ rides(x,bmw)$
3. $\forall x: rides(x,bmw) \rightarrow yuppie(x)$
4. $\forall x: yuppie(x) \rightarrow lawyer(x)$
5. $\forall x:\ \forall y: nicegirl(x) \wedge roughcharacter(y) \rightarrow \sim date(x,y)$
6. Nicegirl(mary) $\wedge biker(john)$