Write the following information in the form of logic statements. For all six of these give a truth table proof and a resolution proof using converting to CNF and then proof by resolution with refutation. Feel free to use excel for your truth table proofs. For each, if its true write an English sentence that explain what you have shown. Also, how many solutions are there?

1. Detective James is solving a case. The four suspects A, B, C and D made the following statements:

* If A is guilty then B was an accomplice
* If B is guilty then either C was an accomplice or A is innocent
* If D is guilty then A is guilty and C is innocent
* If D is guilty then A is guilty

Is D guilty based on these statements?

2. If the Congress refuses to vote for new laws then strike would not be finished. Except for the case when it continues for more than a month and a company's CEO retires. The Congress refuses to operate and strike finishes. Therefore strike was going on for more than a month.

3. If 2 is a prime number then 2 is the smallest prime number. If 2 is the smallest prime number then 1 is not a prime number. 1 is not a prime number. Are the following propositions correct based on the aforementioned statements?

* 2 is the smallest prime number
* 2 is a prime number

4. If tomorrow would be a snow storm then Patrick would wear a heavy coat. But Patrick would only wear heavy coat if zipper would be mended. It would be a snow storm tomorrow and the zipper is not mended. Would Patrick wear a heavy coat?

5. Solutions of equation x2 = 2 are irrational numbers, i.e. it cannot be represented in a fraction x = m/n, where m and n are integers and n is not equals zero.

6. Either Sally and Bob are of the same age or Sally is older than Bob. If Sally and Bob are of the same age then Nancy and Bob are not of the same age. If Sally is older than Bob then Bob is older than Walter. Do those statements imply that either Nancy and Bob are not of the same age or Bob is older than Walter?