Which of the followings are semantically and syntactically correct translation of "No good student copies the homework of his/her friends"?
(Important: each wrong answer will cancel out one correct answer)

- [ ] $\forall x\ \text{GoodStudent}(x) \wedge (\forall y\ \text{Homework}(y, \text{Friend}(x)) \wedge \neg\text{Copies}(x, y))$
- [ ] $\forall x\ \text{GoodStudent}(x) \rightarrow (\forall y\ \text{Homework}(y, \text{Friend}(x)) \rightarrow \neg\text{Copies}(x, y))$
- [ ] $\neg \exists\ \text{GoodStudent}(x) \rightarrow (\exists y\ \text{Homework}(y, \text{Friend}(x)) \wedge \text{Copies}(x, y))$
- [ ] $\neg \exists x,y\ \text{GoodStudent}(x) \wedge \text{Homework}(y, \text{Friend}(x)) \wedge \text{Copies}(x, y)$

Translate the following sentence into FOL by choosing the correct quantifiers and connectives

You can't love all of the people all of the time, but you can love all of the people some of the time and some of the people all of th

[ ] [ ] person (p) and time(t) -> love (p,t)
and
[ ] [ ] person (p) and time(t) -> love (p,t)
and
[ ] [ ] person (p) and time(t) -> love (p,t)

Consider the following sentence

[(Motivation → Success) V (Discipline → Success)] → [(Motivation ∧ Discipline) → Success]

Important : Use the following format. Otherwise your answer will not be graded.

Leave only a single blank between each literal/connective/paranthesis.

Use capital letters

Use "~" or "NOT" for the negation

Use "V" or "OR" for the disjunction

Use "AND" for the conjunction

Use "M" for "Motivation"

Use "D" for "Discipline"

Use "S" for "Success"

Part 1: Convert the sentence above into CNF by exactly following each of the steps below.

a) Eliminate "→" symbols in the following part of the sentence.

(M → S) V (D → S)

b) Eliminate "→" symbol in the following part of the sentence.

(M ∧ D) → S

c) Now, write the final sentence in CNF all together for the entire sentence

[(M → S) V (D → S)] → [(M ∧ D) → S]

Part 2:

Now, negate the final sentence that you obtained in Part1

Part 3: List each of the clauses in the negated sentence

1.

2.

3.

4.

Part 4: Apply resolution, to reach to contradiction. Show each of your steps below by first writing the new sentence you obtained. Then, on the right hand side write the rules (from above) that you used in resolution. If you reached to contradiction write "FALSE"

New Sentence/RuleID,RuleID

5. / ,

6. / ,

7. / ,

8. / ,

Part 5:

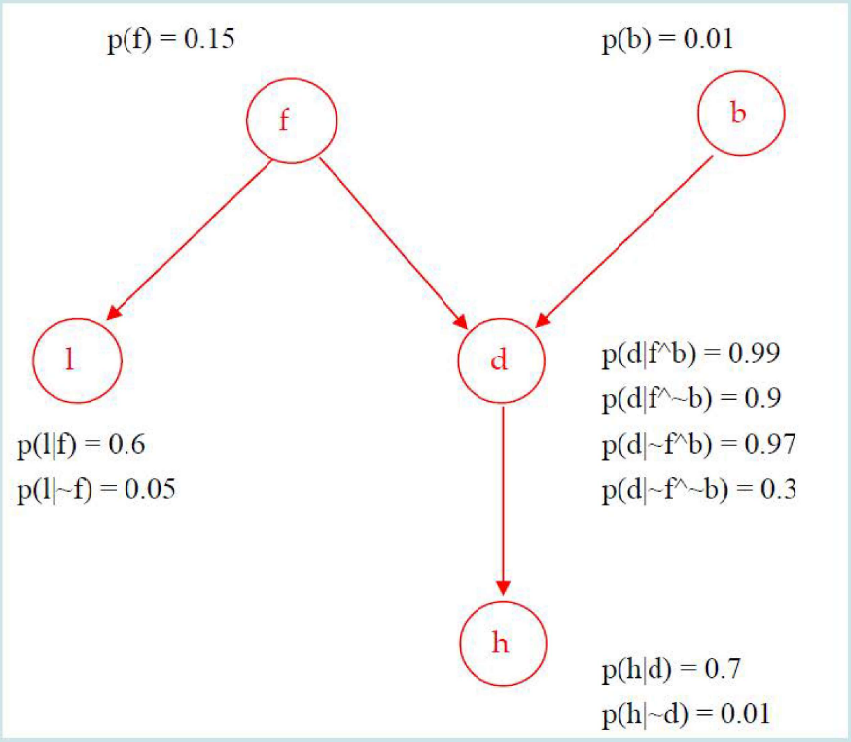
What was the reson in applying all these steps. What did you prove. Complete the following sentence:

The sentence [(Motivation → Success) V (Discipline → Success)] → [(Motivation ∧ Discipline) → Success] is

○UNSATISFACTORY ○SATISFACTORY ○VALID

Which of the followings are semantically and syntactically correct translation of "No good student copies the homework of his/her friends"?
(Important: each wrong answer will cancel out one correct answer)

- [ ] $\forall x \ \text{GoodStudent}(x) \land (\forall y \ \text{Homework}(y, \text{Friend}(x)) \land \neg \text{Copies}(x, y))$
- [x] $\forall x \ \text{GoodStudent}(x) \rightarrow (\forall y \ \text{Homework}(y, \text{Friend}(x)) \rightarrow \neg \text{Copies}(x, y))$
- [ ] $\neg \exists \ \text{GoodStudent}(x) \rightarrow (\exists y \ \text{Homework}(y, \text{Friend}(x)) \land \text{Copies}(x, y))$
- [x] $\neg \exists x,y \ \text{GoodStudent}(x) \land \text{Homework}(y, \text{Friend}(x)) \land \text{Copies}(x, y)$



Consider the Bayesian Network above. Answer the following questions by exactly following the format. Write all in lowercase letters without leaving a blank in between the characters. `x` symbol represents the product. Use alphabetical order when you need an order.

a) Write the formula to compute the following probability using the conditional independence assumption in Bayesian networks.

p(b,d,f,~h,~l) = p(b) x p() x [ ] x [ ] x [ ]

b) What is the value of the following probability

Important: Use the format exactly as used in the description of the question.

Consider the dataset given below for a Naïve Bayes Classification problem to decide whether there will be only a few or many customers (#Customers) given the features: Day of the Week (DoW), Rainy, Temperature.

DoW	Rainy	Temperature	#Customers
weekday	no	hot	few
weekday	yes	cool	few
weekend	yes	cool	few
weekend	yes	moderate	many
weekday	no	moderate	many
weekday	no	cool	many
weekend	no	cool	many
weekend	yes	hot	many

a) Write the values for the corresponding probabilities in the form of ratios:

P(#Customers=few) = [ ] / [ ]

P(DoW=weekday|#Customers=few) = [ ] / [ ] P(DoW=weekend|#Customers=few) = [ ] / [ ]

P(Rainy=yes|#Customers=few) = [ ] / [ ] P(Rainy=no|#Customers=few) = [ ] / [ ]

P(Temperature=hot|#Customers=few) = [ ] / [ ] P(Temperature=cool|#Customers=few) = [ ] / [ ] P(Temperature=moderate|#Customers=few) = [ ] / [ ]

P(#Customers=many) = [ ] / [ ]

P(DoW=weekday|#Customers=many) = [ ] / [ ] P(DoW=weekend|#Customers=many) = [ ] / [ ]

P(Rainy=yes|#Customers=many) = [ ] / [ ] P(Rainy=no|#Customers=many) = [ ] / [ ]

P(Temperature=hot|#Customers=many) = [ ] / [ ] P(Temperature=cool|#Customers=many) = [ ] / [ ] P(Temperature=moderate|#Customers=many) = [ ] / [ ]

b) Recall that the Naïve Bayes Classifier selects the most likely class C_{NB} given the feature values $f_1, f_2, \ldots, f_n$. That is: $C_{NB} = \text{argmax}_{c_j \in C} P(c_j) \prod P(f_i \mid c_j)$, where c_j is the j^{th} class and f_i is the i^{th} feature.

Write the formulas to compute the following probabilities. Exactly use the given format in a case-sensitive manner. Use the order of probabilities as listed above. Do not leave any blanks

P(#Customers=few | DoW=weekday, Rainy=no, Temperature=moderate) =

[ ] x [ ] x [ ] x [ ]

P(#Customers=many | DoW=weekday, Rainy=no, Temperature=moderate)

[ ] x [ ] x [ ] x [ ]

Fill in the values below by using the probabilities that are required in the above formula (use the same order above)

P(#Customers=few | DoW=weekday, Rainy=no, Temperature=moderate) = [ ] / [ ] x [ ] / [ ] x [ ] / [ ] x [ ] / [ ]

P(#Customers=many | DoW=weekday, Rainy=no, Temperature=moderate) = [ ] / [ ] x [ ] / [ ] x [ ] / [ ] x [ ] / [ ]

What will be the #Customers for a day where DoW=weekday, Rainy=no, Temperature=moderate?

- few
- many

1 2 3

Finish attempt ...

Time left **0:59:10**

Given

$\forall$ x,y [g(x,y) $\leftrightarrow$ z (f(x,z) $\rightarrow$ f(y,z))]

Prove

$\forall$x,y,z [(g(x,y) $\wedge$ g(y,z)) $\rightarrow$ g(x,z)]

Hint: (a) negate the sentence that you want to prove, (b) convert all sentences into CNF, (c) drop quantifiers and (d) use resolution to prove a contradiction.