SCS 1204 – Discrete Mathematics
Tutorial 3

1. Find the argument form for the following argument and determine whether it is valid. Can we conclude that the conclusion is true if the premises are true?

> If George does not have eight legs, then he is not a spider.
> George is a spider.
> ---
> George has eight legs.

2. Find the argument form of the following argument and determine whether it is valid.

If Nimal does not study hard, then he is not going to pass the exam.
Nimal passed the exam.

Therefore, Nimal studied hard.

3. What rules of inference are used in this argument?

> "No man is an island. Manhattan is an island. Therefore, Manhattan is not a man."

4. What rule of inference is used in each of these arguments?

(a) Kangaroos live in Australia and are marsupials. Therefore, kangaroos are marsupials.

(b) It is either hotter than 100 degrees today or the pollution is dangerous. It is less than 100 degrees outside today. Therefore, the pollution is dangerous.

(c) Linda is an excellent swimmer. If Linda is an excellent swimmer, then she can work as a lifeguard. Therefore, Linda can work as a lifeguard.

(d) Steve will work at a computer company this summer. Therefore, this summer Steve will work at a computer company or he will be a beach bum.

(e) If I work all night on this homework, then I can answer all the exercises. If I answer all the exercises, I will understand the material. Therefore, if I work all night on this homework, then I will understand the material.

5. Use rules of inference to show that the hypotheses:

(i) "If it does not rain or if it is not foggy, then the sailing race will be held and the lifesaving demonstration will go on,"

(ii) "If the sailing race is held, then the trophy will be awarded,"

(iii) "The trophy was not awarded"

imply the conclusion:

It rained.

6. Test the validity of the following argument:

No professors are ignorant. All ignorant people are vain. Therefore, no professors are vain.

7. Test the validity of the following argument:

"First year students and third year students are not allowed to enroll in a graph theory course. Nimal is enrolled in a graph theory course. Therefore, Nimal is not a third-year student."

Assume that the universe is the set of all Computer Science students at UCSC and Nimal is a particular Computer Science student at UCSC.

8. Alan will be at the park if Chandra is there and Bill is not there. Chandra will be at the park if it is a Friday or Saturday. If Bill is at the park, Denesh will be there. Denesh won't be at the park if it is a Friday. Today is a Friday. Therefore, Alan will be at the park.

9. Determine whether the following argument is valid. If it is a valid argument, give a formal proof. If the argument is invalid, show that it is invalid by finding an appropriate assignment of truth values to the propositional variables.

$$P \to (q \wedge r), \quad s \to r, \quad r \to p. \quad \text{Therefore } s \to q.$$

10. Consider the following argument.

If giraffes are green then either bears are brown or else rabbits are not red. Rabbits are red and bears are not brown. Therefore giraffes are not green.

Define the following propositions:
b: bears are brown
g: giraffes are green
r: rabbits are red

(i) State the argument in symbols

(ii) Rewrite the symbolic argument as a proposition

(iii) Construct a truth table for the proposition

(iv) State whether the argument is valid