

MATH/CSE 1019: DISCRETE MATH FOR COMPUTER SCIENCE  
FALL 2011

Assignment 1 (Released September 26 , 2011)  
Submission deadline: 6:45 pm, October 3 2011

Notes:

1. The assignment can be handwritten or typed. It MUST be legible.
2. You must do this assignment individually.
3. Submit this assignment only if you have read and understood the policy on academic honesty on the course web page. If you have questions or concerns, please contact the instructor.
4. Use the dropbox near the CSE main office to submit your assignments, OR submit your assignment online using the submit command from a CSE machine (follow instructions on the class webpage). No late submissions will be accepted. Please do not send files by email.
5. Your answers should be precise and concise. Points may be deducted for long, rambling arguments.

## Question 1

[3 points] Form the contrapositive of these statements:

1. If you don't take the final examination, you will get an F for the course.
2. If a quadrilateral is a rectangle, it has 4 equal angles.
3. If a triangle has either two equal sides or two equal angles, then it is an isosceles triangle.

## Question 2

[6 points] Decide whether the following statements are tautologies or contradictions or neither. Prove your answer in each case.

1.  $(p \rightarrow q) \vee (q \rightarrow p)$ .
2.  $(p \wedge q) \vee (q \rightarrow \neg p)$ .
3.  $(p \vee \neg q) \rightarrow (q \wedge \neg p)$ .

## Question 3

[6 points] Each argument below is either correct or it has a fallacy (but not both!). Write the argument in symbols and then determine whether the argument is valid. If it is valid, write whether it uses *modus ponens* or *modus tollens*. If it is not valid, write whether it is an inverse fallacy or a converse fallacy.

1. If both numbers are even, then the sum is even. They are not both even. Therefore the sum is not even.
2. If this University is large, then it has large departments. This University has large departments. Therefore, it is large.
3. If you didn't buy from us, then you paid too much. You did buy from us. Therefore, you didn't pay too much.

## Question 4

[5 points] Write down the negations of the following expressions, so that the  $\neg$  symbol does not arise to the left of any quantifier. Indicate whether the negated statement is true. Assume  $\mathbb{R}$  to denote the real numbers and  $\mathbb{Q}$  to denote the rational numbers. Recall that rational numbers are those that can be expressed as  $p/q$  where  $p, q$  are integers and  $q \neq 0$ .

1.  $\forall x \in \mathbb{R}, \exists y \in \mathbb{R}, (x \cdot y = 1)$ .
2.  $\forall x > 0, \exists y \in \mathbb{R}, (y > x) \wedge (x + 3y = 2x)$ .