

# Discrete Math 2018

## problem set 4

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1. Let P and Q denote predicate statements. Explain the meaning of  $P \vdash Q$ .
2. Describe the following inference rules using provability.
  - A. Modus ponens
  - B. Modus tollens
  - C. Hypothetical syllogism
3. State the theorem of deduction.
4. Express natural deduction of introducing implication
5. Express natural deduction of two versions of eliminating implication
6. Explain each of the following introduction and elimination rules for quantifiers

$$\frac{\Gamma \vdash Pc}{\Gamma \vdash \forall x : Px} \quad (\forall I)$$

$$\frac{\Gamma \vdash \forall x : Px}{\Gamma \vdash Pc} \quad (\forall E)$$

$$\frac{\Gamma \vdash Pc}{\Gamma \vdash \exists x : Px} \quad (\exists I)$$

$$\frac{\Gamma \vdash \exists x : Px}{\Gamma \vdash Pc} \quad (\exists E)$$