

Sample First Mid Term

- (1) Consider the statement: if $a > b$, then $f(a) > f(b)$.
 - (a) What is the contrapositive of this statement?
 - (b) What is the converse of this statement?
 - (c) What is the negation of this statement.
- (2)
 - (a) Determine the truth table for $(P \Rightarrow Q) \Rightarrow (Q \Rightarrow P)$
 - (b) Find a simpler statement equivalent to $(P \Rightarrow Q) \Rightarrow (Q \Rightarrow P)$.
- (3) Prove from the axioms for ordered fields that if $0 < x < y$, then $x^3 < y^3$.
- (4) Prove that if $a^2 \geq 7a$, then $a \leq 0$ or $a \geq 7$.
- (5) Prove that

$$\prod_{i=2}^n \left(1 - \frac{1}{i^2}\right) = \frac{n+1}{2n}$$

for all $n \geq 2$.

- (6) Prove that $A \subset B$ if and only if $A \cup B \subset B$.