



Statistics 117  
First Long Exam

S117-LE1-001  
Mathematics for Statistics  
Second Semester, A.Y. 2013 – 2014

- I. Identify whether the following statements are tautology, contingency or contradiction using Truth Tables.
- $(K \rightarrow L) \equiv (K \wedge \sim L)$
  - $[P \vee (Q \wedge R)] \leftrightarrow [(P \vee Q) \wedge (P \vee R)]$
  - $\sim (P \wedge Q) \leftrightarrow [(\sim Q \vee R) \rightarrow S]$
- II. Prove the following:
- $P$   
 $\therefore [(P \wedge Q) \vee (P \wedge \sim Q)]$   
 $\exists x, S(x) \vee Q(x) \rightarrow [\forall x, (Q(x) \rightarrow (N(x) \vee D(x)))]$
  - $\exists x, Q(x) \wedge \sim D(x)$   
 $\therefore \exists x, N(x)$
  - A horse that is registered for today's race is not a thoroughbred. Every horse registered for today's race has won a race this year. Therefore a horse that has won a race this year is not a thoroughbred.
- III. Prove the following statements.
- If  $x^2$  is odd then  $x$  is odd.
  - If  $r - \frac{1}{r} = 5$  then  $r$  is irrational.
  - If  $x < 1$  then  $\frac{x}{x^2 + 3} < \frac{1}{4}$ .
  - $1 + x + x^2 + \dots + x^n = \frac{x^{k+1} - 1}{x - 1}$  using Mathematical Induction.
  - $\exists x, x^2 + 5x + 6 = 0$ .
- IV. Disprove the following statements.
- If I studied hard or I am very good in Math then I will pass Stat 117 or I will get rich. Therefore, If I studied hard, I will get rich.
  - If  $x^2 < y^2$  then  $x < y \forall x, y \in \mathbb{R}$ .