ASSIGNMENT 1 (MATHEMATICAL ECONOMICS)

M.A.-1

Date: September 2, 2008.

Attempt all questions. This assignment will be graded

1. Let A, B, C be sets. Prove each of the following:
(a) $C - (A \bigcap B) = (C - A) \bigcap (C - B)$**;**
(b) If $A, B \subset C$**, then** $A - B = A \bigcap (C - B)$**;**

2. Let $A \subset X$ **and** $B \subset Y$ **be sets. Prove that** $(X * Y) - (A * B) = [(X - A) * (Y - B)] \bigcup [(X - A) * B] \bigcup [A * (Y - B)]$**.**

3. Let $f : X \to Y$ **be a function. Let** $\{X_i\}_{i \in I}$ **be a family of subsets of** X **and let** $\{Y_i\}_{i \in I}$ **be a family of subsets of** Y**. Prove that** $f[\bigcap_{i \in I} X_i] = \bigcap_{i \in I} f(X_i)$ **holds if** f **is injective.**

4. Prove that the set v **:** $N * N$ **is countable.**

5. Prove that the set of integers Z **is countable by constructing a bijective function** $f : N \to Z$**.**

6. Using mathematical induction prove that :
if $a \geq -1$**, then** $(1 + a)^n \geq 1 + na$ **for** $n = 1, 2, ...$

7. Show that the well-ordering principle implies the principle of mathematical induction and vice-versa.

8. Prove that $a = [3 + \sqrt{2}]^{2/3}$ **does not represent a rational number.**

9. Does completeness axiom hold for set of rational numbers?

10. Consider the set $\bigcap_{n=1}^{\infty} (1 - 1/n) \bigcap (1 + 1/n)$**. Find out supremum and infimum (if exist(s)) of the set.**

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