Name_____

MA2201 / CS2022
Test #1

Tuesday, April 4, 2006

#1.
a) (4 Points) Given

p: Today is Tuesday
q: We have a test today

Write propositions for each of the following:

(i) If today is Tuesday, then we have a test today

(ii) If we don't have a test today, then today is not Tuesday

(iii) If we have a test today, then today is Tuesday

(iv) If today is not Tuesday, then we do not have a test today.

b) (2 Points) Given:

In(s,m): Student *s* is enrolled in math class *m*
C(s): Student *s* owns a cat

Write the predicates for:

(i) There is at least one math student (that is, some student in some math class) who owns a cat.

(ii) No math student owns a cat.

#2. (4 Points) For sets A and B, show A x B when:

(i) $A = \{1, 2\}, B = \varnothing$

(ii) $A = \{1, 2\}, B = \{\varnothing\}$

#3. For sets A and B, show $\sim (A \cap B) = \sim A \cup \sim B$:

a) (8 Points) with a proof showing each side is a subset of the other. (Be clear!)

b) (4 Points) with Venn diagrams

#4 (6 Points) If $f(x) = \sum_{i=1}^{5} x^i$, what is O(f(x))?

#5. (6 Points) Determine if the following are True or False. If true, prove it; if false, state a counter-example.

a) f(x) = $\lfloor x \rfloor$ is a 1-1 where x is a real number

b) f(x) = $\lfloor x \rfloor$ is onto where x is a real number

c) The sum of any two even integers is even

#6. (6 Points) Prove by mathematical induction

$$2n + 1 < 2^n$$