University of Bahrain
College of Science
Department of Mathematics
Second Semester 2012/2013

Course: MATHS 253
Test 2
Date: 21/05/2013
Time: 8:00-9:00

Name:

ID Number: Serial No Section No:

Make sure your exam has 3 different questions and 4 pages including the front page.

Question	Maximum Marks	Marks Obtained
1	7	
2	9	
3	9	
Total	25	

All work should be shown clearly

Question 1: [3+4 marks]

1) Let $A = \{\emptyset, \{1\}, \{1, \{1\}\}\}$. For each of the following statements write $\mathbb{T}$ if the statement is true and $\mathbb{F}$ if the statement is false.

(a) $\{\emptyset\} \subset A$ ( )
(b) $\emptyset \in A$ ( )
(c) $\{1\} \in A \wedge \{1\} \subset A$ ( )
(d) $\{\{1\}\} \notin P(A)$( )
(e) $\emptyset \subset A$ ( )
(f) $\{1, \{1\}\} \in A$ ( )

2) Use the pick-a-point method to prove $(A \cup B) - C \subset (A - C) \cup (B - C)$

Question 2: [(2+3)+4 marks]

1) Let x and y be real numbers. Consider the following statement (*)

$\forall x, \forall y, (x > 0, y > 0 \Rightarrow xy < (x + y)^2)$

a) Write the negation of (*)

b) Prove or disprove (*) (**Hint:** Expand $(x + y)^2$)

2) For any two nonempty sets B and C prove $A \times B = A \times C \Leftrightarrow A = \emptyset$ or $B = C$.

Question 3: [5+4 marks]

1) Assume a and b are integers. Prove that if a divides b and c divides d then ac divides bd.

2) Use an algebraic method to prove $(A \cap B) - (A \cap C) = A \cap (B - C)$.