

EXAM 4 - MATH 110

Friday, December 13, 2002

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Read each problem **very carefully** before starting to solve it. Each problem is worth 10 points. It is necessary to show your work. Correct answers without explanations are worth 0 points.

GOOD LUCK!!

1. (a) Is it true that for all sets A, B, C , if $A \subseteq C$ and $B \subseteq C$, then $A \cup B \subseteq C$? If yes, **give a formal proof**. If no, **give a counterexample**.
- (b) In this problem, for two sets X, Y , we write $X \not\subseteq Y$ for “it is not the case that $X \subseteq Y$ ”. Is it true that for all sets A, B, C if $A \not\subseteq B$ and $B \not\subseteq C$, then $A \not\subseteq C$? If yes, **give a formal proof**. If no, **give a counterexample**.
2. (a)
 - i. In how many ways can the letters of the word “EIGHT” be arranged in a row?
 - ii. In how many ways can the letters of “EIGHT” be arranged in a row if G and H must remain together (in order) as a unit?
- (b)
 - i. How many 16-bit strings contain exactly nine 1’s?
 - ii. How many 16-bit strings contain at least fourteen 1’s?
 - iii. How many 16-bit strings contain at least one 1?