Instructor: Prof. A. Suciu **Name:** _____

MTH 1101 **Applications of Algebra** **Fall 2002**

QUIZ 5

Instructions: Put your name in the blanks above. Put your final answers to each question in the designated spaces on these pages. Show your work—if there is not enough room, use another sheet.

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(1) Let $U = \{0, 1, 2, 3, 4, 5, 6, 7\}$, $A = \{1, 2, 3\}$, $B = \{0, 2, 3, 4, 5\}$, $C = \{2, 4, 6\}$.

(a) Find each of the following:

(i) $A \cap B^c =$

(ii) $(A \cap B) \cap B^c =$

(iii) $(B \cup C) \cap A^c =$

(b) Determine whether each of the following is true or false:

(i) $3 \notin A$

(ii) $\{0\} \subseteq B$

(iii) $2 \subseteq B$

(iv) $U \not\subseteq C$

(2) List the elements in the set S, where S is defined by:

(a) $S = \{\, x \mid x$ is an odd integer, greater than -4, and less than $8 \,\}$

(b) $S = \{\, x \mid x$ is a letter in the word "FUNDAMENTAL", but not in "MATH" $\}$

(3) In a suburban development, a group of 120 homeowners have made improvements to their houses: 60 homeowners added a new room (R), 75 redone their kitchen (K), and 40 finished their basement (B); 30 have both new kitchens and add-on rooms, 28 have new kitchens and finished basements, 16 have finished basements and add-on rooms, and 12 homewoners have made all three improvements.

(a) Draw a Venn diagram with this information.

(b) How many homeowners have

(i) Made some alteration other than a new kitchen?

(ii) Added a new room, but not touched their kitchen or basement?

(iii) Redone their kitchen or finished their basement, but not added any new room?

(iv) Haven't done any of these improvements (just watched the grass grow)?

(4) Let $U = \{\text{all employees in a hospital}\}$, $N = \{\text{all nurses}\}$, $D = \{\text{all doctors}\}$, $A = \{\text{all administrators}\}$, $M = \{\text{all male employees}\}$, $F = \{\text{all female employees}\}$.

(a) Describe the following sets in terms of unions, intersections and/or complements:

$\{\,\text{all male doctors who are not administrators}\,\} =$

$\{\,\text{all female administrators who are either doctors or nurses}\,\} =$

(b) Describe in a sentence the set defined by $(F \cap D) \cup (F^c \cap N)$.