MATH 320
Exam 1
Spring 1994

1. If $A = \{1, 2, 3, c, f\}$, $B = \{a, 4, d, c, b\}$, $C = \{2, c, d, f, 7\}$, $U = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, a, b, c, d, e, f, g, h\}$, list the elements of the following:

(4) (a) $A \cup B$

(4) (b) $C \cap B$

(4) (c) $(A \cap B) \cap C$

(4) (d) C'

(4) (e) $(A \cup \phi) \cup (B \cap \phi)$

(5) 2. (a) Write the definition of $a + b$ for whole numbers.

(5) (b) Use the definition in part (a) to show that $2 + 4 = 6$.

(5) (c) Give the definition of $a - b$ for whole numbers.

(5) (d) Use the definition in part (c) to show that $9 - 5 = 4$.

3. State which property is illustrated by each of the following: (be sure to name the operation)

(5) (a) $x + y = y + x$

(5) (b) $x \cdot (y + z) = (y + z) \cdot x$

(5) (c) $(a + (b + c)) + d = a + ((b + c) + d)$

(5) (d) $0 \cdot (x + y) = 0$

(5) (e) $a \cdot (bc + d) = a \cdot bc + a \cdot d$

4. Let $A = \{0, 2, 4, 8, 16, 32, \ldots\}$. Answer each of the following and supply a reason for your answer:

(5) (a) Is A closed under addition?

(5) (b) Is A closed under multiplication?

(5) 5. Which whole numbers satisfy the inequality

$$2x + 7 > 40?$$

Write your answer as an inequality. Also, graph the solution set on a number line.

(5) 6. (a) Convert 3231_{four} to base ten.

(5) (b) Convert 296 to base three.

(5) 7. State the low of Trichotomy.

(5) 8. Exhibit a $1-1$ correspondence between the sets $\{a, b, c, d\}$ and $\{1, 2, 3, 4\}$.

(10) EXTRA CREDIT: Exhibit a $1-1$ correspondence between the set of all even whole numbers and the set of all whole numbers that are multiples of three.