MATH 280 Discrete Mathematical Structures Assignment #1   Name _____

The point values for each question is given within []. The total number of points for this assignment is 65.

[12]   1. Describe each of the following sets by listing its elements:

(a) $\{x \mid x \in \mathbb{N} \text{ and } x^2 - 5x + 6 = 0\}$

(b) $\{\frac{1}{x} \mid x \in \{2, 4, 6, 8\}\}$

(c) $\{x \mid x \in \mathbb{R} \text{ and } x^2 = 7\}$

(d) $\{x \mid x \in \mathbb{N} \text{ and } x^2 - 2x - 8 = 0\}$

(e) $\{x^2 \mid x \in \{-2, -1, 0, 1, 2\}\}$

(f) $\{x \in \mathbb{P} \mid x \text{ is a factor of } 24\}$

[42]   2. Let

$$A = \{2, 4, 5, 6, 8\}$$
$$B = \{1, 4, 5, 9\}$$
$$C = \{x \mid x \in \mathbb{Z} \text{ and } 2 \leq x < 5\}$$

be subsets of $U = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$. Find

(a) $A \cup B$

(b) $A \cap B$

(c) $A \cap C$

(d) $B \cup C$

(e) $A - B$

(f) A^C

(g) $A \cap A^C$

(h) $(A \cap B)^C$

(i) $C - B$

(j) $(C \cap B) \cup A^C$

(k) $(B - A)^C \cap (A - B)$

(l) $(C^C \cap B)^C$

(m) U^C

(n) $B \times C$

(o) $\wp(B)$

(p) $A \oplus B$

(q) $B \oplus C$

(r) $|U|$

(s) $|U \times U|$

(t) $|\wp(U \times U)|$

(u) $|\varnothing|$

(v) $|\{\varnothing\}|$

[8] 3. Let

$$A = \{x \mid x \text{ is a word that appears before } dog \text{ in an English language dictionary}\}$$
$$B = \{x \mid x \text{ is a word that appears after } canary \text{ in an English language dictionary}\}$$
$$C = \{x \mid x \text{ is a word of more than four characters}\}$$

Which of the following are true statements?

(a) $B \subseteq C$

(b) $A \cup B = \{x \mid x \text{ is a word in an English language dictionary }\}$

(c) $cat \in B \cap C^C$

(d) $bamboo \in A - B$

[6] 4. Suppose U is an infinite universal set, and A and B are infinite subsets of U. Answer the following questions and justify your answer.

(a) Must A^C be infinite?

(b) Must $A \cup B$ be infinite?

(c) Must $A \cap B$ be infinite?

[8] 5. Find the binary representation of each of the following positive integers:

(a) 64

(b) 67

(c) 28

(d) 256

[10] 6. Calculate the following series:

(a) $\sum\limits_{i=1}^{10} i$

(b) $\sum\limits_{i=1}^{5} 20$

(c) $\sum\limits_{j=1}^{5} (2j+1)$

(d) $\sum\limits_{i=-n}^{n} i$, for $n = 1, 2, 3, 4$

(e) $\prod\limits_{i=1}^{5} i$

[2] 7. Draw the Venn diagram for $\bigcap\limits_{i=1}^{4} A_i$