**Homework 1**

**(100 points)**

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**Late Policy: -10 points per day late**

**Instructions: Include Name and Net ID. This is an individual assignment. Answers should be your own work.**

1. What will be the possible minimum and maximum cardinality of following sets, if X is a set of n numbers and Y is a set of m numbers and n is greater than m. (12 points)

(a) X ∩ Y

(b) X ∪ Y

(c) X – Y

(d) Y - X

1. Prove or disprove following by giving examples: (15 points)

(a) If X ⊂ Y and X ⊂ Z, then X ⊂ Y ∩ Z

(b) If X ⊆ Y and Y ⊆ Z, then X ⊆ Z

(c) If X ∈ Y and Y ∈ Z, then X ∈ Z

1. If P(X) ⊆ P(Y), then what will be the relation between X and Y? (5 points)

Where P(X) = Power set of set X and P(Y) is Power set of set Y.

1. Suppose U = {1, 2,…. 9}, A = all multiples of 2, B = all multiples of 3, and C = {3, 4, 5, 6, 7}. Find C - (B - A). (5 points)
2. What is the difference between function and relation? Explain by giving example.

(5 points)

1. Find the domain and range of these functions. (20 points)
2. the function that assigns to each pair of positive integers the first integer of the pair

b) the function that assigns to each positive integer its largest decimal digit

c) the function that assigns to a bit string the number of ones minus the number of zeros in the string

d) the function that assigns to each positive integer the largest integer not exceeding the square root of the integer

e) the function that assigns to a bit string the longest string of ones in the string

7. Determine whether each of these functions is a bijection from R to R. (16 points)

a) f (x) = −3x + 4

b) f (x) = −3x2 + 7

c) f (x) = (x + 1)/(x + 2)

d) f (x) = x5 + 1

1. If f and f ◦ g are one-to-one, does it follow that g is one-to-one? Justify your answer. (4 points)
2. What can you say about the sets A and B if we know the following:- (12 points)

a) A ∪ B = A? b) A ∩ B = A?

c) A − B = A? d) A − B = B − A?

1. Rewrite the following sets using set builder notation (6 points)
2. {−8, −6, −4, −2, 0, 2, 4, 6, 8}
3. {1, 4, 9, 16, 25, 36, 64, 81, 100}
4. {1, 3, 5, 7, 9, 11, 13, . . . }