**CSC 1500 – Homework 6**

**(1)** Write out the POWER SET. Keep in mind a subset can be made of any combination of elements appearing in the original set (provided it’s a **UNIQUE** combination). (*20 pts.*)

**{1,3,7}**

**{{0},(1},{3},{7},{1,3},{1,7},{3,7},{1,3,7}}**

**(2)** For the following three set definitions, describe the elements in the resulting set. Assume the **universal set** is the entire English alphabet. (*5 pts. each*) (Don’t miss the INVERSE mark on problem 2.3)

Set 1: {A,E,I,O,U,Y}, Set 2: {A,B,C,D,F}, Set 3: {I,J,K,X,Y,Z}

**(2.1)** (1∪2)

{A,E,I,O,U,Y,B,C,D,F}

**(2.2)** (1∩2)∪(1∩3)

{A} U {I,Y} = {A,I,Y}

**(2.3)** ((1’)∩2)

1’ = Alphabet but without vowels.

{B,C,D,F}

**(2.4)** (2∩3)

{Empty set}

**(3)** There are three groups of people, people who like Apples, Bananas, and Cherries. 16 people like Apples. 28 people like Bananas. 12 people like Cherries. 9 people like Apples AND Bananas. 5 people like Bananas AND Cherries. 7 people like Apples AND Cherries. 3 people like all of them. Using this information, answer the following questions. (*10 pts. each*)

A = 16

B = 28

C = 12

A INTERSECT B = 9

B INTERSECT C = 5

A INTERSECT C = 7

A INTERSECT B INTERSECT C = 3

**(3.1)** How many people like Apples but don’t like Bananas?

16 – 9 = 7

**(3.2)** How many people like Bananas with Apples, OR Cherries with Apples, BUT NOT Bananas AND Cherries with Apples?

I drew some friendly circles:

((B INTERSECT A) UNION (C INTERSECT A)) – (B INTERSECT A INTERSECT C) = 10

A picture containing text, handwriting, sketch, notebook

Description automatically generated

**(4)** Each function here is accompanied by two sets. Based on the sets given, tell me if the accompanying functions are either One-to-One, Onto, Neither, or Both. (*10 pts. each*)

|  |  |
| --- | --- |
| **(4.1)** A = {1,2,3,4} B = {a, b, c}  f(1) = a, f(2) = b, f(3) = a, f(4) = c  Onto. All Elements have at least one element in the domain that maps to it. | **(4.2)** A = {1,2,3} B = {a, b, c, d}  f(1) = b, f(2) = c, f(3) = d  One-to-one. All inputs have a unique output, even though all outputs do not have an input. |

**(5)** Is the mapping of the following function One-to-One, Onto, Neither, or Both? (10 pts.)

Domain: Integer Numbers. Codomain: Integer Numbers.

Function: f(x) = x+5

Straight line -> All inputs have unique output. One-to-one

Also onto since every possible output has a least one element in the domain that maps to it because these are both integer numbers. This would not be true If the function was 2x.

**(6)** For the following recursive sequences, please work out the explicit formula to give me the indicated term in the sequence. *(10 pts. Each)*

(4.1) a(1) = 2, a(k) = a(k-1) + 5, 14th term in sequence.

a(k) = a(k-1) + 5 -> every step increases by 5? 5x.

5(1) + b = 2 -> b = -3

F(x) = 5x – 3

5(14) -3 = 67

(4.2) a(1) = 6, a(k) = 1.25\*a(k-1), 9th term in sequence.

a(k) = 1.25\*a(k-1)

GENERIC VERSION FOR AN ITERATIVE ITEM K

Proof by induction case 1: 6

case n = 1.25

a(k) = a(1) \* r^(k-1)

= 6 \* 1.25^(k-1)

= 6\*(1.25)^(9-1) = 35.762