# Question 1

## a.

**i.**

{0, -1}

**ii.**

{1, 4, 7, 10}

## b.

**i.**

we get

**ii.**

we get

## c.

**i.**

It’s true.

Because

**ii.**

It’s false.

Because

and

Obviously, they are different.

**iii.**

It’s true.

Because

## d.

**i.**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| p | q | r |  | s | s | s |
| F | F | F | T | F | F | T |
| F | F | T | T | F | T | T |
| F | T | F | F | F | T | T |
| F | T | T | F | F | T | T |
| T | F | F | T | T | F | F |
| T | F | T | T | T | T | T |
| T | T | F | F | F | T | T |
| T | T | T | F | F | T | T |

**ii.**

This compound proposition is not a tautology, because when p is True, q is False and r is False ,the compound proposition will be False.

## e.

**i.**

False. Because x>0,y>0, so x+y > 0 and x\*y >0

**ii.**

False. If x=1, y=1, then x\*y=1, x+y =2, it will be false.

## f.

**i.**

**ii.**

The original statement is false.

When a=0, it is wrong.

## g.

Assume that

We can get that

We know that , so

We can conclude that the assumption is wrong, so

# Question 3

## a.

Euler path and Euler are both use each edge precisely once, but Euler path is a path while Euler cycle is a cycle, which means Euler cycle is a closed trail.

## b.

set the maximum number of cimparisons are x.

212=4096,211=2048,so x=12

The maximum numer of comparisons are 12.

## c.

**i.**

A path is a trail which neither vertices nor edges are repeated.

**ii.**

we study on each point to get the minimum distance to them. D(n) means the shortest distance from A to n.

D(B)=23

D(C)=39

D(D)=MIN((D(B)+28),(D(C)+20,56)=51

D(E)=MIN((D(D)+11),(D(B)+27))=50

D(F)=MIN((D(D)+21),(D(C)+44))=72

D(G)=MIN((D(D)+37),(D(F)+15))=87

D(H)=MIN((D(F)+27),(D(C)+83))=99

D(I)=MIN((D(H)+20),(D(F)+44),(D(G)+21))=108

So the shortest path from A to I is A-B-D-F-G-I, Which length is 108.

## d.

**i.**

**ii.**

R is not symmetric because aRb, but not bRa.

R is anti-symmetric because there is not a pairwise such that aRb with bRa.

R is not transitive because bRc and cRd but not bRd.

**iii.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | a | b | c | d |
| a | 1 | 1 | 1 | 1 |
| b | 0 | 1 | 1 | 1 |
| c | 0 | 0 | 1 | 1 |
| d | 0 | 1 | 0 | 1 |

**iv.**

=

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | a | b | c | d |
| a | 0 | 1 | 0 | 0 |
| b | 0 | 0 | 1 | 0 |
| c | 0 | 0 | 0 | 1 |
| d | 0 | 1 | 0 | 0 |

## e.

**i.**

S(2)==20+21=3

**ii.**

Basic step:

S(1)=1=21-1

Induction hypothesis:

For all integer k>=1,assume that S(k)=2k-1

Induction step:

As for k+1,S(k+1)= *.*

We can conclude that for any integer n>= 1,S(n)= 2k-1

## f.

we get:

-idempotent law

-distributive law and absorption law

-complement law

So the simplication is