# Discrete math assignment 1

Q1 1a  
use mathematical induction.  
First we prove (lower bound)

1. For ,
2. Suppose is true when .
3. When ,

So (1) \*\*\*\* Then we prove the upper bound  
1. For ,

1. Suppose is true when .
2. When ,

So (2)

By (1) and (2),

1. A possible value of is , to prove this, we use mathematical induction.

we first prove the lower bound: 1. when   
  
2. Suppose is true when . 3. When ,

So (1)

Then we prove the upper bound: 1. when   
  
2. Suppose is true when . 3. When ,

So (2)

By (1) and (2),

Q2

c

Every number in is divisible by 1.

is divisible by 1 (There exists a number in that divides )  
  
So Above establishes that …

Q3 a  
To show that is not , we use prove by contradiction.

Suppose that there are constant pair and such that for all , then their exists constant .  
However, (not converges to a constant). In other words, their is no such that is not less than all possible ), which contradict with our premise.  
This contradiction shows that is not

b  
Note that and when   
 Thus, there exists constants ,  
 whenever .  
so, is

c  
The algorithm is based on Horners’ rule (秦九韶算法).

Evaluate (Array A[0..n], Integer x)  
1. Integer result A[n] 2. for Integer i n to 1 3. result = result \* x + a[i] 4. return result

Analysis of the Evaluate - Line 1:   
- Line 2: n times =   
- Line 3: n times =   
- Line 4:

Worst-case running time = \*\*\*\*

Q4 a

Thus,  
  
This concludes the proof

Q4 b  
??  
singularity is a partition on Set So, or every x in , it is either odd or even. x can be represented either as or

* if x is odd, then x+x = 4n+2, 4n+2 is even
* if x is even, then x+x = 4n, 4n is even.

So for all , R is reflexive.  
(2)  
integer addition is commutative,so   
For all ,   
Thus is symmetric.  
(3)  
consider the case (1,3) 1+3 is even so .

also we have 3+1 is even so

There exists pairs and but   
Thus, R is not antisymmetric.  
(4)  
2n+2n+1 = 4n+1, so adding an odd and a even will result in an odd.  
So, if , x and y must be either two odd numbers or two even numbers.

if , and , and must be either two odd numbers or two even numbers. Then they are either all odd or all even.

* if they are odd, then a+c = 4n+2, 4n+2 is even
* if they even, then a+c = 4n, 4n is even.

Thus, for all and , also . is transitive.