Name: VEN THON
ID: e20191250

Assignment10

1.what is recursion? Give an example of it?
- ➢ Recursion is a principal closely related mathematical induction.
- ➢ Example: remember that n! is 1x2x3x.....xn.

  A recursive definition of n!

  Basic 1!=1

  Inductive n!=n*(n-1)!

2. what are recursively defined sequences? Give 2 example of them?
- ➢ Example1:
  - the sequence $\{a_n\}$ of power of 2 given by a_n for n=0,1,2,3...
  - the same sequence can also be defined recursively:

    $a_0=1$, $a_{n+1}=2a_n$ fpr n=0,1,2,.....
  - obviously, induction and recursion are similar
- ➢ Example2:
  - The sequences $a_{n+1}=a_n r$ if $a_{1=}3$ and r=2 , calculate a_4?
  - The same sequences

    $a_{1=}3$, r=2, $a_{n+1}=a_n r$
  - Obviously,

    $a_1=3$

    $a_2=a_1 r=3(2)=6$

    $a_3=a_2 r=6(2)=12$

    $a_4=a_3 r=12(2)=24$

3. what is recursive defined function? Give 2 example of them?
- ➢ We can use the following method to define a function with the natural number as its domain.
  - Specific the value of the function at zero.
  - Give a rule for finding its value at any integer from its values at smaller integers.

Such a definition is called recursive or inductive definition.
- ➢ Example1: if we have f(n+1)=2f(n)+3 and f(0)=3, how to define f(4)?
  - We define f(4) using recursion. We have:

    F(0)=3, f(n+1)=2f(n)+3
  - Basic: f(0)=3
  - Induction (4 step recursions)
    - F(1)=2f(0)+3=2*3+3=9
    - F(2)=2f(1)+3=2*9+3=21

- o F(3)=2f(2)+3=2*21+3=45
- o F(4)=2f(3)+3=2*45+3=93
- ➢ Example2: we can recursively define the factorial function f(n)=n! where n=4 and by knowing that f(0)=1?
  - • We define f(4) using recursion.
    F(0)=1, f(n+1)=(n+1).f(n)
  - • Basic f(0)=1
  - • Induction (4 step recursions)
    - o F(1)=1f(0)=1
    - o F(2)=2f(1)=2*1=2
    - o F(3)=3f(2)=3*2=6
    - o F(4)=4f(3)=4*6=24

4. what is recursive algorithms?
  - ➢ Is an algorithm which call itself with "smaller (or somple)" input values, and which obtains the result for the current input by applying simple operation to the returned value for the smaller (or simpler) input.

5. what does the initial step of the recursive algorithm do?
  - ➢ Always identify the base case and associated result first.
  - ➢ Make sure the recursive call for a smaller problem (one "closer" to the base case)

6. what dose inductive clause of the recursive algorithm do?
  - ➢ Recursive algorithm are often shorter, more elegant and easier to understand than their iterative counterparts.
  - ➢ However, iterative algorithm are usually more efficient in their use of space and time.