Name and ID#:

AMERICAN UNIVERSITY OF ARMENIA
College of Science and Engineering
CS 121 Data Structures and Algorithms

MIDTERM 1 EXAM

Date:	Tuesday, October 18 2016
Starting time:	09:00
Duration:	1 hour 15 min
Attention:	**ANY TYPE OF COMMUNICATION IS STRICTLY PROHIBITED**

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Please write down your name and ID# at the top of all used pages

Problem 1: Consider below two recursive expressions:

$$a_n = 1 + a_1*b_1 + a_2*b_2 + a_3*b_3 + \ldots + a_{n-1}*b_{n-1}$$
$$b_n = 1 + 2*b_1 + 2*b_2 + 2*b_3 + \ldots + 2*b_{n-1} - b_{n-1}*b_{n-1}$$

The base cases are: $a_1 = b_1 = 1$.

Write an optimal C++ function or Java method that takes as its argument an int index ***int n*** and returns a_n.

```
int rec1(int n)
{ int a,b;
  if (a==1&&b==1)
    return a;
  for(int i=1;i<n;i++)
  { b = 1 + 2*rec(int i)-
    b = rec(b-1)
    b = rec1(n-1)
  a = rec1(b-1) * rec2(n-1);
  return a;
```

$b_1 = 1 \quad a_1 = 1$

$b_2 = 1+2\cdot 1 = 3 \quad a_2 = 1+1\cdot 1 = 2$

$b_3 = 1+2\cdot 1+2\cdot 4 \quad a_3 = 1+1\cdot 1+2\cdot 3$

$b_3 = 7 = 3 \quad a_3 = 8$

$b_1 = 1 \quad a_1 = 1$

$b_2 = 1+2\cdot 1-1\cdot 1 = 2 \quad a_2 = 1+1 = 2$

$b_3 = 1+2+2\cdot 2 = 8-1 = 3 \quad a_3 = 1+2+4 = 7$

```
int rec2(int n)
{ if (b==1) return b;
  b = rec2(n-1);
  return(b);
}
```

constant

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Use the backside, if needed

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