

## OLA-3 :- Discrete Structures

CSCI-3080

Exercise 1.  $C(1) = 5$   
 $C(n) = 2C(n-1) + 5$  for  $n > 1$

1.  $C(1) = 5$
2.  $C(2) = 2 * C(1) + 5 = 2 * 5 + 5 = 15$
3.  $C(3) = 2 * C(2) + 5 = 2 * 15 + 5 = 35$
4.  $C(4) = 2 * C(3) + 5 = 2 * 35 + 5 = 75$
5.  $C(5) = 2 * C(4) + 5 = 2 * 75 + 5 = 155$

→ The first 5 recursive values from the sequence are 5, 15, 35, 75, 155

Exercise 2.  $A(1) = 2$   
 $A(n) = nA(n-1) + n$  for  $n > 1$

1.  $A(1) = 2$
2.  $A(2) = 2 * A(1) + 2 = 2 * 2 + 2 = 6$
3.  $A(3) = 3 * A(2) + 3 = 3 * 6 + 3 = 21$
4.  $A(4) = 4 * A(3) + 4 = 4 * 21 + 4 = 88$
5.  $A(5) = 5 * A(4) + 5 = 5 * 88 + 5 = 445$

→ The first 5 recursive values from the sequence are 2, 6, 21, 88, 445

Exercise 3. (a)  $P(1) = 500$   
 $P(n) = 1.012 * P(n-1)$  for  $n > 1$

(b.) Using this equation, I can tell that balance is increasing around 6 dollars every year and with this pace it will take about 12 years to clear \$570 mark.

$$P(12) \approx 570.11$$



Exercice 4  $S(n) = C^{n-1} S(1) + \sum_{i=2}^n C^{n-i} g(i)$

$B(1) = 5$

$B(n) = 3B(n-1)$  for  $n > 1$

$C = 3, g(n) = 0, S(1) = 5$

$S(n) = 3^{n-1} (5) + \sum_{i=2}^n 3^{n-i}$

$\therefore B(n) = 3^{n-1} (5) + \sum_{i=2}^n 3^{n-i} * 0$

$B(n) = 3^{n-1} * (5)$

Exercice 5

A.  $P(1) = 1000$

$P(n) = 1.03 * P(n-1) + 100$  for  $n > 1$

B.  $C = 1.03$

$g(n) = 100$

$P(1) = 1000$

$P(n) = 1.03^{n-1} * 1000 + \sum_{i=2}^n 1.03^{n-i} * 100$

$P(n) = 1.03^{n-1} * (900 + 100) + 1.03^{n-2} * 100 + 1.03^{n-3} * 100 \dots + 1.03^{n-n} * 100$

$P(n) = 1.03^{n-1} * 900 + 1.03^{n-1} * 100 + 1.03^{n-2} * 100 + \dots + 1.03^{n-n} * 100$

$P(n) = 1.03^{n-1} * 900 + (1.03^{n-1} + 1.03^{n-2} + 1.03^{n-3} + \dots + 1.03^{n-n}) * 100$

$P(n) = 1.03^{n-1} * 900 + (1.03^{n-n} + 1.03^{n-(n-1)} + \dots + 1.03^{n-3} + 1.03^{n-2} + 1.03^{n-1} * 100)$

$P(n) = 1.03^{n-1} * 900 + 100 * \sum_{i=0}^{n-1} 1.03^i$

$P(n) = 1.03^{n-1} * 900 + 100 * \frac{1.03^n - 1}{1.03 - 1}$



$$C. \quad PC(8) = 1.03^{8-1} * 900 + 100 * \frac{1.03^8 - 1}{1.03^8 - 1}$$

The account would be worth 1996.1201 at the beginning of 8<sup>th</sup> year.

PC(8)	1996.1201
-------	-----------