CSCE 222 [503] Discrete Structures for Computing
Spring 2015 – Philip C. Ritchey

Problem Set 5

Due dates: Electronic submission of the PDF file for this homework is due on **2/26/2015 (Thursday) before 11:59 p.m.** on `http://ecampus.tamu.edu`. A signed and stapled paper copy of the PDF is due on **2/27/2015 (Friday)** at the beginning of class.
You must show your work. **No work → no credit.**

Name: **(Han Hong)**

Resources. Discrete Mathematics and Its Applications by Rosen, (additional people, books, articles, web pages, etc. that have been consulted when producing this homework)

On my honor, as an Aggie, I have neither given nor received any unauthorized aid on any portion of the academic work included in this assignment. Furthermore, I have disclosed all resources (people, books, web sites, etc.) that have been used to prepare this homework.

Signature: ____________________

Problem 1. (11 points) Using a proof similar to the one in class for the geometric series, prove that

$$\sum_{i=0}^{n-1} i = \frac{n(n-1)}{2}$$

Solution.

$$LetS = \sum_{i=0}^{n-1} i$$

$$=> 2S = \sum_{i=0}^{n} n + 1$$

$$=> 2S = n(n+1)$$

$$S = \frac{n(n-1)}{2}$$

Problem 2. (11 points) Derive a general closed-form solution for the sum of an arithmetic progression $\{a_n\}$:

$$\sum_{i=m}^{n} a_i$$

Solution.

$$\sum_{i=m}^{n} a_i = \sum_{i=0}^{n} a_i - \sum_{i=0}^{m-1} a_i$$

=====> $\frac{n(n+1)}{2}$ - $\frac{m(m-1)}{2}$

Problem 3. (12 points) Section 2.4, Exercise 17 d, f, h page 168
*You must show your **work** to get **credit**.*

Solution.
d. $a_n = a_{n-1} + 2n + 3$; a$_o = 4$
$a_o = 4$
$a_1 = 4 + 2(1) + 3 = 9$
$a_2 = 9 + 2(2) + 3 = 16$
=>a$_n = (2 + n)^2$
f. $a_n = 3a_{n-1} + 1$; a$_o = 4$
$a_o = 1$
$a_1 = 3(1) + 1 = 4$
$a_2 = 3(4) + 1 = 13$
$a_3 = 3(13) + 1 = 40$
$=> Geometricseries : \frac{3n(n+1)}{2} + 1h.a_n = 2na_{n-1}$; a$_o = 1$
$a_1 = 2(1)(1) = 2$
$a_2 = 2(2)2 = 8$
$a_3 = 2(3)(8) = 48$
=>$2^n n!$

Problem 4. (11 points) Section 2.4, Exercise 24, page 169

Solution.
a. B(k) = $\frac{r}{12}$B(k-1) - P
b. P = $\frac{r}{12}$B(T-1)

Problem 5. (11 points) Section 2.4, Exercise 34, page 169

Solution.
a. $=> \sum_{i=1}^{3}((i-1)+(i-2))$ = ((1 1) + (1 2)) + ((2 1) + (2 2)) + ((3 1) + (3 2))
= 0 1 + 1 + 0 + 2 + 1 = 3.
b. $=> \sum_{i=0}^{3}$((3i+2*0)+(3i+2*1)+(3i+2*2))
$= \sum_{i=0}(9i + 6)$
=9 * 0 + 6 + 9 * 1 + 6 + 9 * 2 + 6 + 9 * 3 + 6
=81
c. $=> \sum_{i=1}^{3}$(0+1+2)
$= \sum_{i=1}^{3} 3$
= 3 + 3 + 3 = 9

Problem 6. (11 points) Section 2.4, Exercise 36, page 169

Solution.
$\sum_{k-1}^{n} \frac{1}{k(k+1)} = \sum_{k-1}^{n} \frac{1}{k}$ - $\frac{1}{k+1}$ = $(1\frac{}{2}$ - $\frac{1}{2})$ + $(\frac{1}{2}$ - $\frac{1}{3})$... $(\frac{1}{n}$ - $\frac{1}{n+1})$
ALL cancels out, leaves $1\frac{}{n+1}$

Problem 7. (11 points) Section 2.4, Exercise 40, page 169

Solution.
Take sum from 1 to 200 minus sum from 1 too 99, will give result from 99 to 200
Answer: 379507500

Problem 8. (11 points) Section 2.4, Exercise 44, page 170

Solution.
$\prod_{i=n}^{1}$ i

Problem 9. (11 points) Section 2.4, Exercise 46, page 170

Solution.
$\prod_{n=0}^{4} j! = 0! * 1! * 2! * 3! * 4! = 1 * 1 * 2 * 6 * 24 = 288$

Checklist:

( ) Did you add your **name**?

( ) Did you disclose all **resources** that you have used?
(This includes all people, books, websites, etc. that you have consulted)

( ) Did you **sign** that you followed the Aggie honor code?

( ) Did you solve **every problem**?

( ) Did you submit the PDF file of your homework on **eCampus**?

( ) Did you submit a **signed and stapled** hardcopy of the PDF file **in class**?