CS 228, Sequence and Summation Exercises

Name:

Some of the questions below are modified versions of exercises from *Discrete Mathematics and It's Applications 7e* by Kenneth Rosen.

Sequences

What are the terms a_0, a_1, a_2 and a_3 of the sequence $\{a_n\}$, where a_n equals

a) $2^n + n$

b) $n^{(n+1)!}$

c) $\lceil n/2 \rceil$

d) $\lfloor n/2 \rfloor + \lceil n/2 \rceil$

Find the first five terms of the sequence defined by each of these recurrence relations and initial conditions.

a) $a_n = 3a_{n-1}, \quad a_0 = 3$

b) $a_n = 2a_{n-1} + 1, \quad a_0 = -2$

c) $a_n = a_{n-1} + 3n + 2, \quad a_0 = 0$

d) $a_n = 2a_{n-1} + 2a_{n-2}, \quad a_0 = 1, a_1 = 1$

Use the method of forward substitution to find a closed form solution to the sequence in a).

Use the method of forward substitution to find a closed form solution to the sequence in b).

Use the method of forward substitution to find a closed form solution to the sequence in c). This one is more difficult. The "Useful Summation Formulae" from p.166 may be helpful. Particularly $\sum_{k=1}^{n} k = n(n+1)/2$

Summations

Calculate the following sums:

a) $\displaystyle\sum_{i=1}^{5} i - 3$

b) $\displaystyle\sum_{i=0}^{4} (-3)^i$

c) $\displaystyle\sum_{i \in A} i^2$ where $A = \{x \in \mathcal{Z} \mid 0 < x < 6 \wedge x \neq 3\}$

d) $\displaystyle\sum_{k=3}^{n} k$ (recall that $\sum_{k=1}^{n} k = n(n+1)/2$)

e) $\displaystyle\sum_{i=1}^{2}\sum_{j=1}^{3} 2i + j$

f) $\displaystyle\sum_{i=1}^{3}\sum_{j=i}^{3} j$