cse547/ams547 PRACTICE MIDTERM Spring 2010
(10 extra points)

NAME **ID:** **ams/cs**

THE TEST IS WORTH 10 EXTRA PTS. You get 1pt for each of attempted problems. We will correct ONE problem of OUR choice (same for all students) - for up to 5 points

QUESTION 1 Prove

$$S_n + a_{n+1} = a_0 + \sum_{k=0}^{n} a_{k+1},$$

for $S_n = \sum_{k=0}^{n} a_k$

QUESTION 2 Evaluate the following sum by using 3 methods.

$$S_n = \sum_{k=0}^{n} k3^k$$

1. Perturbation method

2. Multiple sum method (Method 5)
HINT: $k = \sum_{j=1}^{k} 1$.

3. Summation by Parts method. Write all details.

QUESTION 3 We know that $x^{\underline{m+n}} = x^{\underline{m}}(x-m)^{\underline{n}}$.

Prove that the following property hold for all integer m and n, $x \in R$, unless one of the denominators is zero.

$$\frac{x^{\underline{m}}}{(x-n)^{\underline{m}}} = \frac{x^{\underline{n}}}{(x-m)^{\underline{n}}}$$

QUESTION 4 Compute $\triangle(c^{\underline{x}})$, for $x, c \in R$ and use it to evaluate the sum

$$\sum_{k=1}^{n} \frac{(-2)^{\underline{k}}}{k}.$$

Explain all your steps.

QUESTION 5 Use the repertoire method to evaluate a closed formula for

$$S_n = \sum_{k=0}^{n} (-1)^k \; k^2.$$

HINT: Generalize it and use functions $R_n = 1$, $R_n = (-1)^n$, $R_n = n(-1)^n$, and $R_n = n^2(-1)^n$. Write CAREFULLY all steps of computations.

Extra space