

**COT 5507: Analytic Methods in Computer Science  
Spring 2006**

**Assignment 2**

**Due: 17 Apr 2006, 5 pm.**

1. (20 points) Use the generating function manipulations listed in table 334 to derive a closed form expression for the generating function whose coefficient for  $z^n$  is defined as follows:  $2 \cdot 2^n + (-1)^{n/2} \cdot 3$ , when  $n$  is even, and  $2 \cdot 2^n$  when  $n$  is odd.
2. (20 points) Use the generating function manipulations listed in table 334 to derive a closed form expression for the generating function whose coefficient for  $z^n$  is defined as follows:  $n(-2)^n$ .
3. (20 points) Use the generating function manipulations listed in table 334 to derive a closed form expression for the generating function whose coefficient for  $z^n$  is defined as follows:  $(2)^{n-1}/n$ , when  $n > 0$ , and  $0$  when  $n = 0$ .
4. (20 points) Solve the following recurrence, using generating functions:  
 $g_0 = -1/3$ ,  $g_1 = -7/18$ ,  $g_n = (-2/3)g_{n-1} + (1/3)g_{n-2}$ ,  $n > 1$ .
5. (20 points) Solve the following recurrence, using generating functions:  
 $g_0 = 0$ ,  $g_1 = 2$ ,  $g_2 = -6$ ,  $g_n = -3g_{n-1} + g_{n-2} + 3g_{n-3}$ ,  $n > 2$ .