

Exercise for Analysis of Algorithms

Exercise T12

Compute the generating functions of the following series:

1. $a_n = 2^n + 3^n$
2. $b_n = (n + 1)2^{n+1}$
3. $c_n = \alpha^n \binom{k}{n}$
4. $d_n = n - 1$
5. $e_n = (n + 1)^2$

Exercise T13

Compute:

$$(a) [z^n] \frac{1}{1+2z} \quad (b) [z^n] \frac{z+1}{z-1} \quad (c) [z^n] \left(\frac{z+1}{z-1} \right)^2 \quad (d) [z^n] \frac{1}{\sqrt[3]{5+z}}$$

Exercise T14

```
f(int n){
  int s=0;
  if (n==0) return 1;
  for (int i=0;i<n;i++)
    s+=f(i);
  return s;
}
```

Compute how often the 5th line of this program is executed using generating functions.

Exercise H9

Solve this recurrence using generating functions:

$$a_n = 2a_{n-1} + 3a_{n-2}$$

and $a_0 = 0, a_1 = 2$.