RWTH Aachen **WS 2025**
Theoretical Computer Science Exercise 5
Rossmanith–Gehnen 27.11.2025

Exercise for Analysis of Algorithms

Exercise 17

Solve the following recurrence relation by order reduction:

$$a_0 = 8000 \qquad a_1 = \frac{1}{2} \qquad a_{n+2} + a_{n+1} - n^2 a_n = n!$$

Exercise 18

Solve the following recurrence relation:

$$a_0 = 0 \qquad a_1 = 1 \qquad a_{n+2} + a_{n+1} - n^2 a_n = n!$$

This is the same recurrence relation as in the last task, but the initial conditions are different. You can either use order reduction as in the last task, but you can also choose whatever method you like.

Exercise 19

Solve the following recurrence relation:

$$a_n = n + 1 + \frac{1}{n} \sum_{k=0}^{n-1} a_k \text{ for } n > 0 \text{ and } a_0 = 2$$

Exercise 20

How often is the loop in the following excerpt executed if $0 < i$ holds at the beginning?

```
while i <= j
i := i+j;
j :=j+10;
```