PS Algorithms and Data Structures 2026

Task sheet 2

Task 4

The sorting algorithm Insertion-Sort can also be defined recursively. To sort the array $A[1, .., n]$, $A[1, .., n-1]$ is sorted and the element $A[n]$ is inserted into the rest of the array. Write the appropriate pseudo code.

Task 5

Given the following algorithm, which expects an array A as input.

```
1: MAGIC(A[1, ..., n])
2:     max = −∞
3:     for i = 1 to n − 1
4:         for j = i + 1 to n
5:             if A[i] + A[j] > max
6:                 max = A[i] + A[j]
7:     return max
```

What does this algorithm calculate? Show that there is also a more efficient algorithm for this calculation. What are the running times of the algorithms?

Task 6

Let $g(n)$ and $f(n)$ be two non-negative functions. Show that $\max\{f(n), g(n)\} = \Theta(f(n)+g(n))$ applies.