**W1D2 Solution**

***Question 1.***

**Algorithm 1**

Algorithm findThirdMax(A, n)

Input array A of n integers

Output third maximum element of A

firstMax <- A[0] // 2

secondMax <- A[0] // 2

thirdMax <- A[0] // 2

indexOfFirstMax <- -1 // 1

indexOfSecondMax <- -1 // 1

for i <- 0 to n do // n

if A[i] > firstMax then // 2n

firstMax <- A[i]; // 2n

indexOfFirstMax <- i; // n

{increment counter i} // 2n

for i <- 0 to n do // n

if i != indexOfFirstMax AND A[i] > secondMax then // 3n

secondMax <- A[i]; // 2n

indexOfSecondMax <- i; // n

{increment counter i} // 2n

for i <- 0 to n do // n

if i != indexOfFirstMax AND i != indexOfSecondMax AND A[i] > thirdMax then // 4n

thirdMax <- A[i]; // 2n

{increment counter i} // 2n

return thirdMax; // 1

**Total // 9 + 26n**

**Algorithm 2**

Algorithm findThirdMax(A, n)

Input array A of n integers

Output third maximum element of A

max 🡨 A[0] // 2

preMax 🡨 A[0] // 2

prePreMax 🡨 A[0] // 2

indexOfMax 🡨 -1 // 1

indexOfPreMax 🡨 -1 // 1

for i 🡨 0 to n do // n

if A[i] > max then // 2n

preMax 🡨 max // n

max 🡨 A[i] // 2n

indexOfMax 🡨 i // n

if i != indexOfMax AND A[i] > preMax then // 3n

prePreMax 🡨 preMax // n

preMax 🡨 A[i] // 2n

indexOfPreMax 🡨 i // n

if i != indexOfMax AND i != indexOfPreMax AND A[i] > prePreMax then // 4n

prePreMax 🡨 A[i] // 2n

{increment counter i} // 2n

return prePreMax; // 1

**Total // 9 + 22n**

***Question 2.***

| **Fn** | **Complexity** |
| --- | --- |
| 10, 1 | O(1) |
| log(log n) | O(log(log n)) |
| log n, ln n | O(log n) |
| n1/k (k > 3) | O(n1/k) |
| n1/3 | O(n1/3) |
| n1/3log n | O(n1/3log n) |
| n1/2 | O(n1/2) |
| n1/2log n | O(n1/2log n) |
| nlog n, log nn | O(nlog n) |
| n2 | O(n2) |
| n3 | O(n3) |
| nk (k > 3) | O(nk) |
| 2n | O(2n) |
| 3n | O(3n) |
| n! | O(n!) |
| nn | O(nn) |