HW5 – Written

7.19

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 3 | 1 | 4 | 1 | 5 | 9 | 2 | 6 | 5 | 3 | 5 | Move pivot to right end |
| 3 | 1 | 4 | 1 | **5** | 9 | 2 | 6 | 5 | **3** | 5 | Swap |
| 3 | 1 | 4 | 1 | 3 | **9** | 2 | 6 | **5** | 5 | 5 | Swap |
| 3 | 1 | 4 | 1 | 3 | 5 | **2** | **6** | 9 | 5 | 5 | Intersection. Swap pivot |
| 3 | 1 | 4 | 1 | 3 | **5** | **2** | 5 | 9 | 5 | 6 | Recurse left |
| 3 | 1 | 4 | 1 | 3 | 5 | 2 |  |  |  |  | Move pivot to right end |
| **3** | **1** | 4 | 2 | 3 | 5 | 1 |  |  |  |  | Swap |
| **1** | **3** | 4 | 2 | 3 | 5 | 1 |  |  |  |  | Intersection. Swap pivot |
| 1 | 1 | 4 | 2 | 3 | 5 | 3 |  |  |  |  | Insertion sort the left side |
| 1 |  |  |  |  |  |  |  |  |  |  | Recurse right |
|  |  | 4 | 2 | 3 | 5 | 3 |  |  |  |  | Move pivot to right end |
|  |  | **4** | 2 | **3** | 5 | 3 |  |  |  |  | Swap |
|  |  | 3 | **2** | **4** | 5 | 3 |  |  |  |  | Intersection. Swap pivot |
|  |  | 3 | 2 | 3 | 5 | 4 |  |  |  |  | Insertion sort the left side |
|  |  | 2 | 3 |  |  |  |  |  |  |  | Insertion sort the right side |
|  |  |  |  |  | 4 | 5 |  |  |  |  | Insertion sort the right side |
|  |  |  |  |  |  |  |  | 6 | 9 | 5 | Swap |
|  |  |  |  |  |  |  |  | 5 | 6 | 9 | DONE |
| 1 | 1 | 2 | 3 | 3 | 4 | 5 | 5 | 5 | 6 | 9 |  |

7.23

Yes. If the array is perfectly sorted, then taking the first element as pivot would result in quadratic time. If the array is perfectly reverse-sorted, then taking the last element as pivot would result in quadratic time. For arrays partially sorted, which is close to a random arranged array, the middle position is likely to be close to the optimal pivot (the actual median), giving an average runtime of O(n) = n\*log(n). Quadratic time is thus unlikely.