Due date: Monday, April 26, 9:59 AM. You will need to submit this via GradeScope. Late problem sets are not accepted beyond a very short grace period.

For this assignment, each answer must be contained within a single piece of paper, although you are allowed to use multiple pages for the assignment. When you submit to GradeScope, you will need to inform the system which page of your scanned PDF contains the answer. *Do this even if your submission is a single page. Failure to do so may cost you points.*

Please review the syllabus and course reference for the expectations of assignments in this class. Remember that problem sets are not online treasure hunts. You are welcome to discuss matters with classmates, but remember the Kenny Loggins rule. Remember that you may not seek help from any source where not all respondents are subject to UC Irvine's academic honesty policy.

1. Consider the problem of finding a *local minimum* in an array. The value $A[i]$ is a local minimum if - and only if - $A[i-1] \geq A[i] \leq A[i+1]$. Give an efficient **divide and conquer** algorithm to find a local minimum in an array A in which $A[1] = A[n] = \infty$. State the runtime of your algorithm, both as a recurrence relation and in asymptotic notation and briefly (1-2 sentences is sufficient) explain the correctness of your algorithm.

   For example, if your input array A is:

∞	10	23	17	20	1	2	3	4	-3	5	∞

   then any of the grayed cells could be returned as a valid answer (you need only to find *one* local minimum, not all of them).

   A solution with running time $\Omega(n)$ will receive no credit for this problem.

2. Suppose you have two ordered vectors (sorted in ascending order), each of which contain n distinct comparable elements. There are no elements in common between the two vectors. Give an algorithm that, with $\mathcal{O}(\log n)$ queries, determines the median value of the *union* of the two. Note that we are minimizing the number of queries, not necessarily running time.

Not Collected Questions

These questions will not be collected. Please do not submit your solutions for them. However, these are meant to help you to study and understand the course material better. You are encouraged to solve these as if they were normal homework problems. This section references problems in the textbook by Goodrich and Tamassia.

This homework (approximately) covers §8.1, 8.2, 9.2 and Chapter 11. One of the strengths of this book is that it has a good variety and quality of practice problems.

If you need help deciding which problems to do, consider trying R-8.4, R-8.5, R-8.6, C-8.2, C-8.5, C-8.12, A-8.1, A-8.2, A-8.3, A-8.4, A-8.8, R-9.1, C-9.8, C-9.11, C-9.12, A-9.4, A-9.7, R-11.6, C-11.3, A-11.2, A-11.6.

It is also recommended that you be proficient with the Master Theorem.