Assignment 2
Due: January 23, 2020

Problem 1: Jarvis March (Gift Wrapping Algorithm) For this question you will need to research the Jarvis March convex hull algorithm. Be sure to cite your sources (ACM or IEEE formatted is preferred).

(a) [10 points] Give pseudocode describing the Jarvis March algorithm, a brief description of how it works, and explain its best and worst case efficiency.

(b) [5] points Give an example input on which Jarvis March will perform significantly better than Graham’s scan and explain why it will perform better.

(c) [5] points Give an example input on which Graham’s Scan will perform significantly better than Jarvis March and explain why it will perform better.

Problem 2: Find the Missing Number You are given a list of $n-1$ integers $A$, in the range of 1 to $n$. There are no duplicates in the list. One of the integers is missing. (Feel free to assume that $n = 2^m$ for some integer $m$)

(a) [5 points] Give an efficient algorithm for finding the missing number, show its complexity, and argue its correctness. (You should try for $O(n)$-time and $O(1)$-space, less efficient solutions will still get partial credit)

(b) [10 points] For this question you are not allowed to access an entire integer with a single operation. The elements of the list are represented in binary, and the only operation you can use to access them is $\text{GETBINARYDIGIT}(A[i], j)$ which returns the $j$th bit of element $A[i]$ which runs in constant time. Give an efficient algorithm for finding the missing number under these constraints, show its complexity, and argue its correctness. (You should try for $O(n)$-time and $O(\log n)$-space, less efficient solutions will still get partial credit)

Example: If we run $\text{GETBINARYDIGIT}(A[i], j)$ with $A[i] = 29$ and $j = 2$, it would return a 0 since $29 = 11101$. 

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