

HW2

Problem 1

- 1. Points:

index	position
0	(3, 1)
1	(4, 4)
2	(5, -1)
3	(2, -1)
4	(2, 2)
5	(2, 1)
6	(4, -1)
7	(6, 1)
8	(8, 1)
9	(8, 5)
10	(7, 4)
11	(3, 3)

Afer sorting:

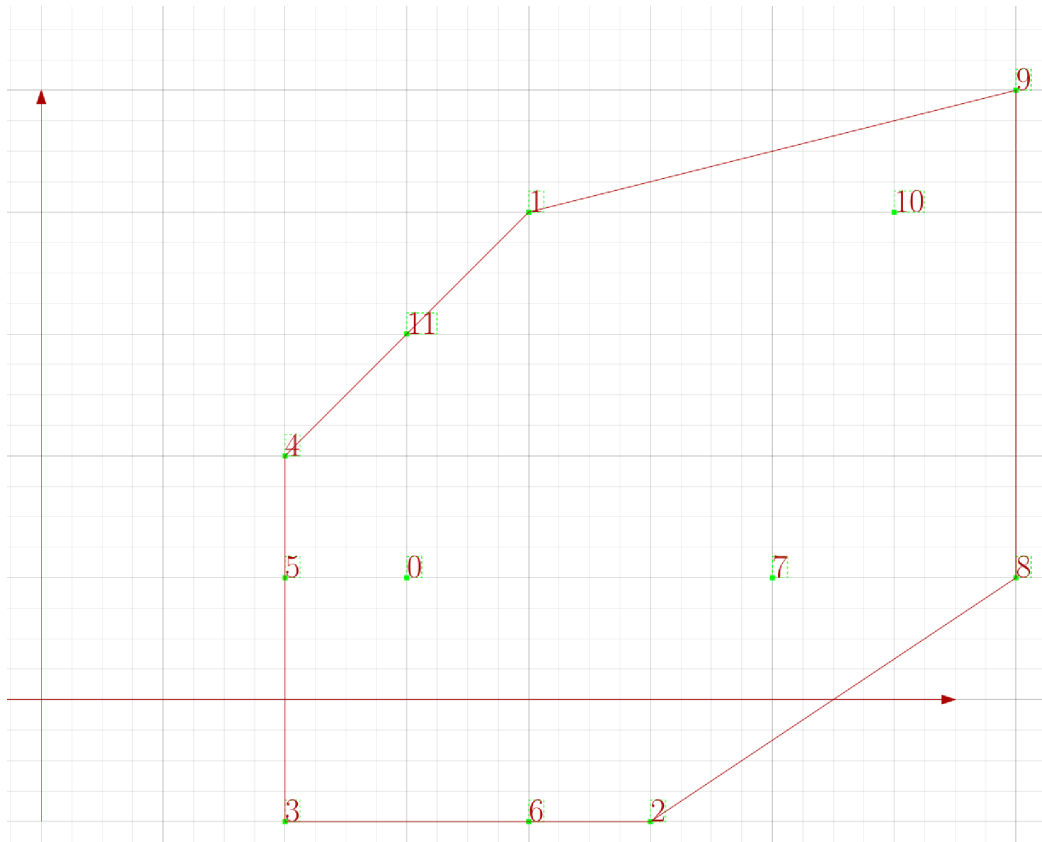
index	position	deleted
2	(5, -1)	False
8	(8, 1)	False
7	(6, 1)	True
9	(8, 5)	False
10	(7, 4)	False
1	(4, 4)	False
11	(3, 3)	False
0	(3, 1)	True
4	(2, 2)	False

index	position	deleted
5	(2, 1)	False
6	(4, -1)	True
3	(2, -1)	False

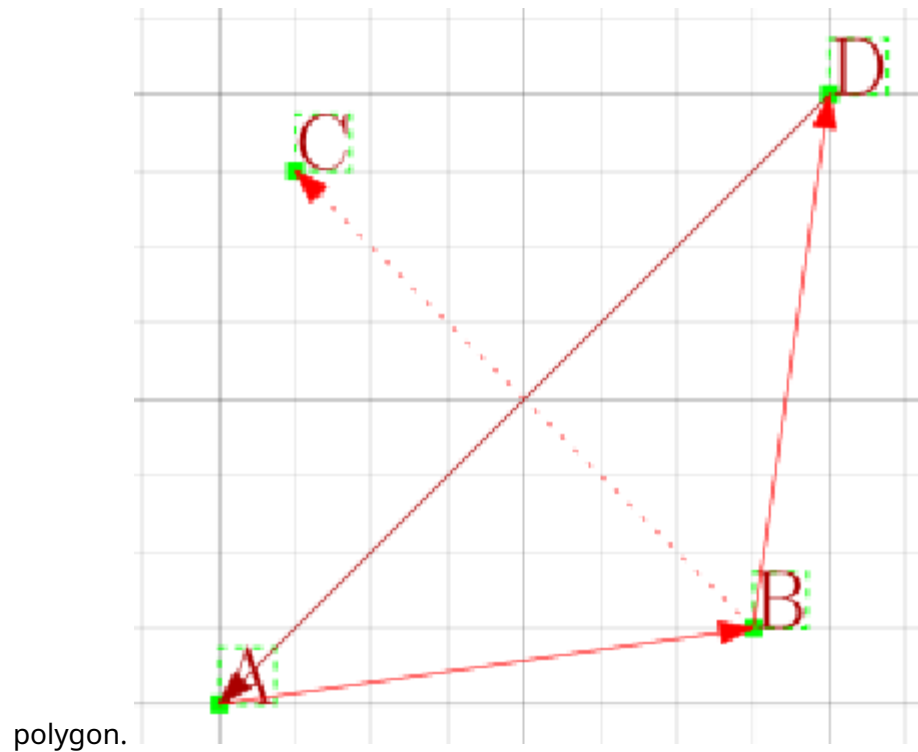
Stack history:

i	stack
2	8,2
3	9,8,2
4	10,9,8,2
4	9,8,2
5	1,9,8,2
6	11,1,9,8,2
6	1,9,8,2
7	4,1,9,8,2
8	5,4,1,9,8,2
8	4,1,9,8,2
9	3,4,1,9,8,2

image:

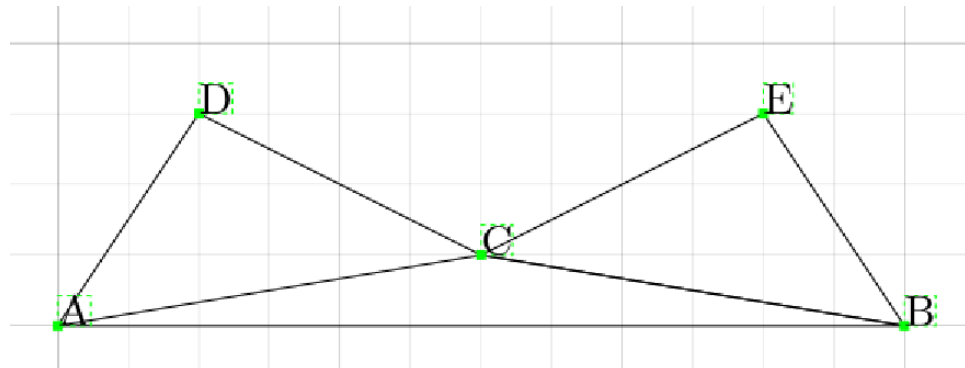


2.
 - - 1. Because the stack only iterate through points once and exactly once, one point either push in or push in then pop out which take constant time k . So the total time is $k*n$ which is $O(n)$.
 - 2. Consider a square $ABDC$, p_0 and p_1 is A and B . Then we go to C and push it. Then D , however $B-C-D$ makes a right turn so we pop C then push D . Then we form a convex polygon with points A,B,D , but C is not inside the



Problem 2

1.
 - - QuickHull(p9 , p3 , {p0 , p1 , p2 , p4 , p5 , p6 , p7 , p8 , p10 , p 11 , p12 })
 - QuickHull(p9 , p5 , {p4 , p11 , p8 , p10})
 - QuickHull(p9 , p11 , {p4})
 - QuickHull(p11 , p5 , {p10})
 - QuickHull(p5 , p3 , {p6 , p7 , p1})
 - QuickHull(p7 , p3 , {p1})
2.
 - 1. Correct, this is basically the same as Graham scan.
 2. Wrong, counter example, c is the smallest angle but c is not a part of convex hull.



- 3. Correct, base on Akl-Toussaint heuristic, for a set of points, the one with the highest y coordinate must be a part of the convex hull.
- 4. Correct, this is a Ellipse with same focuses but different axis. The one with longer axis must contain the one with shorter axis but not vise

- versa. Thus, the point with highest sum must be a part of convex hull.
- 5. Wrong, same graph as question 2, C is the one with minimal distance sum however it is not a part of convex hull.