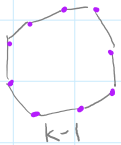


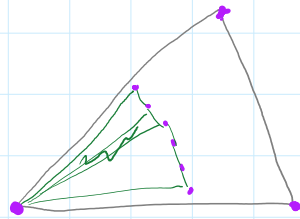
INCREMENTAL ALGORITHM COMPLEXITY: $O(n^2)$

Sorting n points: $O(n \log n)$
 runtime grows not worse than proportionally to $n \log n$

loop: k from 4 to $n \leftarrow O(n)$
 loop: i from 1 to $k-1$ (worst case)



worst case: $3 + 4 + 5 + \dots + (n-1) = \frac{n(n-1)}{2} - 3 = O(n^2)$



disadvantage: intermediate hulls may contain lots more points than the final hull

GIFT-WRAPPING ALGORITHM

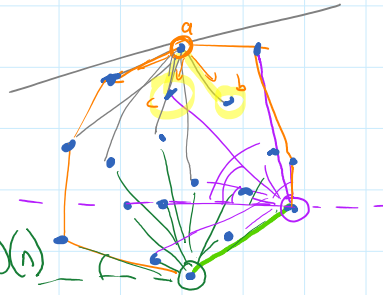
(1) Start with the lowest point $O(n)$

$O(nh)$ (2) Compute angles from starting point to all other points. The point with the largest angle is the next point on the hull. $O(n)$

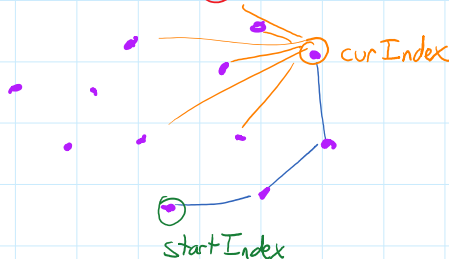
(3) Repeat (2), working CCW around the hull until returning to the starting point.

h times, $h = \text{number of hull vertices}$

leftOf[a,c,b] returns True



this point should be next nextIndex



```

nextIndex = 1
for i from 2 to length(pts):
    if pts[i] is right of pts[nextIndex]:
        nextIndex = i
    
```

Complexity: $O(n) + O(nh) = O(nh)$

Worst case: $h = n$

e.g. all points on a circle

best case: $h = 3$

