

### Experiment 3

Aim: To solve convex hull problem using Brute Force, Divide & Conquer & Graham scan method and compare the efficiency of their running times.

Theory: Convex hull refers to the smallest polygon that encloses the given points (that is convex in nature)

1) Brute-force algorithm: It checks all possible combinations of points. Efficient only for small datasets.  
Time complexity:  $O(n^3)$  Space complexity:  $O(1)$

2) Graham Scan: In this algorithm, we select a point with lowest y-coordinate & then sort the remaining points in increasing order of polar angle w.r.t. that point. It then proceeds to construct convex hull using a stack.

Time complexity:  $O(n \log n)$  Space complexity:  $O(n)$

3) Divide & Conquer: This algorithm divides the set of points into 2 equal halves & finding convex hull of each half. It then combines these 2 convex hulls & does so recursively till the final convex hull is formed.

Time complexity:  $O(n \log n)$  Space complexity:  $O(n)$

Conclusion: Brute force is useful for only small datasets, whereas Graham scan & divide & conquer are useful for large data sets.