1. 141. Write a program that finds the convex hull of a set of 2D points using the brute force approach.

   Input:

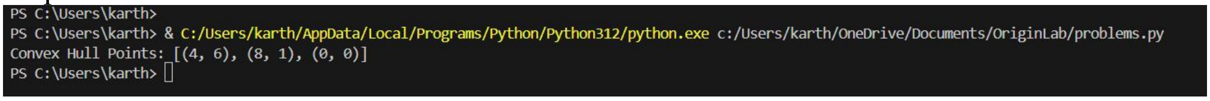
   - A list or array of points represented by coordinates (x, y).

     Points: [(1, 1), (4, 6), (8, 1), (0, 0), (3, 3)]

Code:

```
def is_left(a, b, c):

    return (b[0] - a[0]) * (c[1] - a[1]) - (b[1] - a[1]) * (c[0] - a[0]) > 0

def is_right_or_collinear(a, b, c):

    return (b[0] - a[0]) * (c[1] - a[1]) - (b[1] - a[1]) * (c[0] - a[0]) <= 0

def convex_hull_brute_force(points):
    hull = []
    n = len(points)

    for i in range(n):
        for j in range(i + 1, n):
            a, b = points[i], points[j]
            left_side = [is_left(a, b, points[k]) for k in range(n) if k != i and k != j]
            right_or_collinear = [is_right_or_collinear(a, b, points[k]) for k in range(n) if k != i and k != j]

            if all(left_side) or all(right_or_collinear):
                if a not in hull:
                    hull.append(a)
                if b not in hull:
                    hull.append(b)

    return hull

points = [(1, 1), (4, 6), (8, 1), (0, 0), (3, 3)]

convex_hull_points = convex_hull_brute_force(points)
print("Convex Hull Points:", convex_hull_points)
```

output:



```
PS C:\Users\karth>
PS C:\Users\karth> & C:/Users/karth/AppData/Local/Programs/Python/Python312/python.exe c:/Users/karth/OneDrive/Documents/OriginLab/problems.py
Convex Hull Points: [(4, 6), (8, 1), (0, 0)]
PS C:\Users\karth> 
```

Time complexity:f(n)=o(nlogn)