# Convexity

Given a finite set of points $S = \{p_1, \ldots, p_n\}$ in $\mathbb{R}^d$ and a point $q$ in $\mathbb{R}^d$ design a Linear Program that answers the following question: Is q in the convex hull of $S$?

Write a function `is_in_convex_hull(S, q)` that implements the above algorithm

Because of Carathéodory theorem, a convex hull of $n$ points in $\mathbb{R}^d$ can always be reduced to a convex hull of $d+1$ points. When $q$ is in the convex hull of $S$, how many non-zero entries do you have in the solution? Why?