

Assignment-4

1. A set C is midpoint convex if whenever two points a, b are in C , the average or midpoint $(a + b)/2$ is in C . Obviously a convex set is midpoint convex. It can be proved that under mild conditions midpoint convexity implies convexity. As a simple case, prove that if C is closed and midpoint convex, then C is convex.
2. Let $C \subseteq \mathbb{R}^n$ be a convex, with $x_1, \dots, x_k \in C$, and let $\theta_1, \dots, \theta_k \in \mathbb{R}$ satisfy $\theta_i \geq 0$, $\theta_1 + \dots + \theta_k = 1$. Show that $\theta_1 x_1 + \dots + \theta_k x_k \in C$ for $k \geq 3$.
3. Show that the convex hull of a set S is the intersection of all convex sets that contain S .

- Hints

1. Submission due: 2025/Nov./10
2. Submit to lecwlzhao@163.com, email title “assignment4_your-name + your student number”