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## convex combination

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Let  $V$  be some vector space over  $\mathbb{R}$ . Let  $X$  be some set of elements of  $V$ . Then a *convex combination* of elements from  $X$  is a linear combination of the form

$$\lambda_1 x_1 + \lambda_2 x_2 + \cdots + \lambda_n x_n$$

for some  $n > 0$ , where each  $x_i \in X$ , each  $\lambda_i \geq 0$  and  $\sum_i \lambda_i = 1$ .

Let  $\text{co}(X)$  be the set of all convex combinations from  $X$ . We call  $\text{co}(X)$  the *convex hull*, or *convex envelope*, or *convex closure* of  $X$ . It is a convex set, and is the smallest convex set which contains  $X$ . A set  $X$  is convex if and only if  $X = \text{co}(X)$ .