

## REAL NEIGHBORHOODS

## Why

Often when speaking of a set, we are interested in speaking of those elements which are close to it.

## **Definition**

Let  $x \in \mathbb{R}^d$  A subset  $N \subset \mathbb{R}^d$  is a neighborhood of x if there is a  $\delta > 0$  such that  $B(x, \delta) \subset N$ . The set  $\mathcal{N}_a$  of neighborhoods of x is called the *complete system of neighborhoods* of the point a.

We interpret a neighborhood of a point  $x \in X$  as a set containing all the points of X that are sufficiently close to a. A neighborhood of x "encloses" x by virtue of it containing an open ball about a.<sup>1</sup>

<sup>&</sup>lt;sup>1</sup>Future editions will continue to treatment, including pointing out that an open ball at x is a neighborhood of x and of all elements in the ball.

