

open set, closed set, Neighborhood

Definition

Ball and sphere

Given a point  $x_0 \in X$  and a real number  $r > 0$  we define

(a)  $B(x_0; r) = \{x \in X \mid d(x, x_0) < r\}$  open ball

(b)  $\bar{B}(x_0; r) = \{x \in X \mid d(x, x_0) \leq r\}$  closed Ball

(c)  $S(x_0; r) = \{x \in X \mid d(x, x_0) = r\}$  (sphere)

$x_0$  is called the center and

$r$  is radius

(2)  $S(x_0; r) = \bar{B}(x_0; r) - B(x_0; r)$

an open ball of radius  $r$  is the set of all points in  $X$  whose distance from the center of the ball is less than  $r$

open set

A subset  $M$  of a metric space  $X$  is said to be open if it contains a ball about each of its points.

closed set

A subset  $M$  of  $X$  is said to be closed if its complement is open is that

$M^c = X - M$  is open