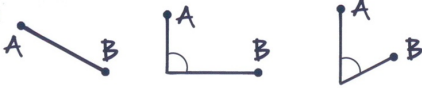


# METRICS

HOW DO WE MEASURE DISTANCES?



## WHAT IS A METRIC?

A metric is a system of measuring distances defined by axioms and certain values that differentiate one metric from another.

## AXIOMS

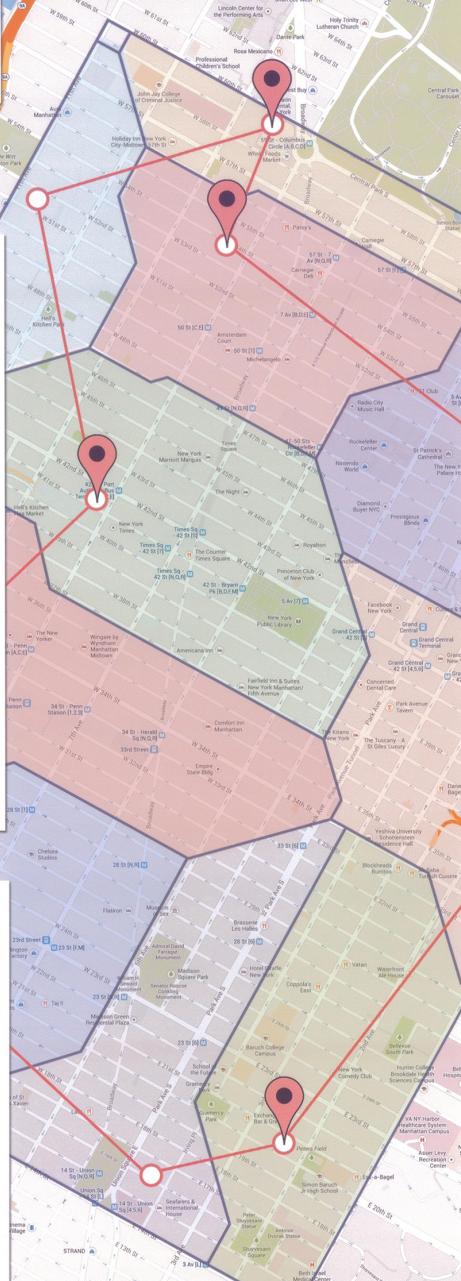
Axioms are essential rules that define something and they are valid under all circumstances.

There are four axioms of metrics:

- 1 A distance between two points is always higher or equal to zero.
- 2 If the distance between two points is zero, it's the same point.
- 3 The distance between point A and point B is equal to the distance between point B and point A.
- 4 If we have three given points, the sum of two distances is always higher or equal the remaining distance.



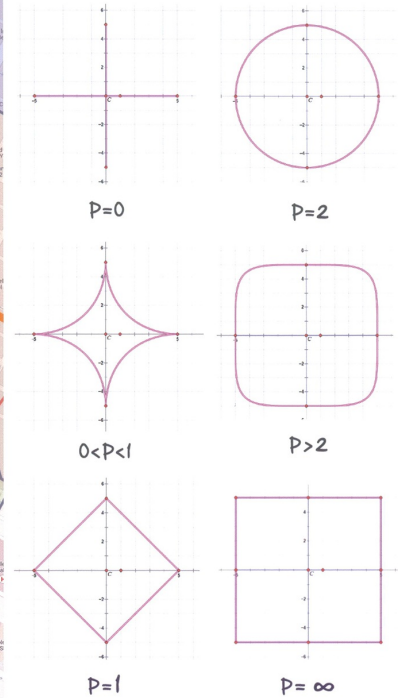
Euclidean Voronoi diagram of New York police stations



## CIRCLES IN VARIOUS METRICS

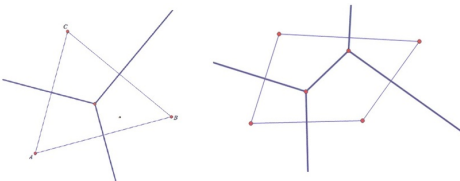
$$K... y = \pm \sqrt{r^2 - |x|^2}$$

$r = \text{radius}$

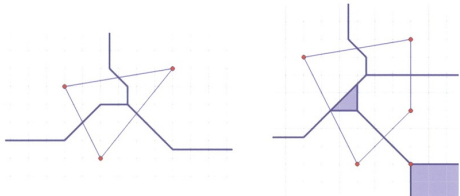


## VORONOI DIAGRAMS

Voronoi diagrams divide a plane into such parts that each one of them contains one of the given points and all the points that are closer to that point more than to any other.



Euclidean geometry



Taxicab geometry

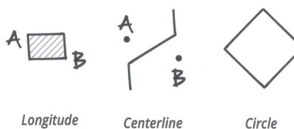
## WHY IS TAXICAB GEOMETRY IMPORTANT?

We can imagine the way of getting from point A to point B as a way of reaching places in a city that has an orthogonal network of streets and use Voronoi diagrams to help us get to a certain place as fast as possible.

## TAXICAB GEOMETRY

Taxicab geometry is a metric in which the distance between two points is the sum of the differences of their cartesian coordinates.

### HOW DO THINGS APPEAR IN TAXICAB GEOMETRY?



Longitude

Centerline

Circle

## HOW DO WE DEFINE A...



**Longitude** = a set of points that connects two given points in a way that the sum of distances from any point to the given edge points of the longitude is equal to the length of the longitude itself



**Centerline** = a set of points that divides a longitude in two equal parts and each point is equally distanced from both marginal points of the given longitude



**Circle** = a set of points that are equally distanced from a given point which is the centre of the circle