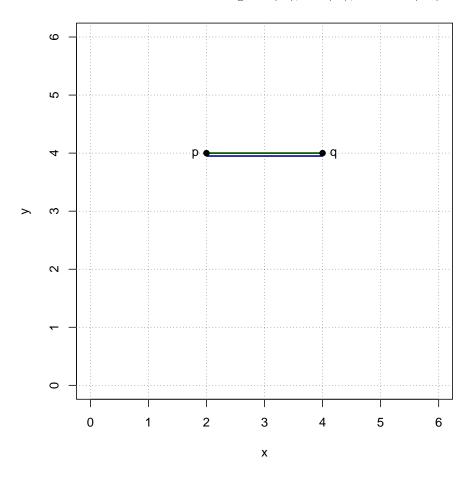
## 1. Problem

Given two points p = (2, 4) and q = (4, 4) in a Cartesian coordinate system:

- (a) What is the Manhattan distance  $d_1(p,q)$ ?
- (b) What is the Euclidean distance  $d_2(p,q)$ ?
- (c) What is the maximum distance  $d_{\infty}(p,q)$ ?

## Solution

The distances are visualized below in green  $(d_1)$ , red  $(d_2)$ , and blue  $(d_{\infty})$ .



- (a)  $d_1(p,q) = \sum_i |p_i q_i| = |2 4| + |4 4| = 2.$
- (b)  $d_2(p,q) = \sqrt{\sum_i (p_i q_i)^2} = \sqrt{(2-4)^2 + (4-4)^2} = 2.$
- (c)  $d_{\infty}(p,q) = \max_{i} |p_i q_i| = \max(|2 4|, |4 4|) = 2.$