Assignment 1; Due Friday, September 30

Read the preface. Skim section 0, ignoring everything about groups for now.
Carefully read section 1 on metric spaces. I will probably not lecture on
this section until Friday, so you will be on your own with the first exercise set.
This will never happen again. If you are puzzled, come to my office hours
on Thursday.

For Friday, do exercises 1.2, 1.3abe. In part a), only do the cases
d = ||x − y|| and d = ∑ |x_i − y_i|. When you do the first of these
cases, you will find it useful to use the inequality ||x + y|| ≤ ||x|| + ||y||.
Undergraduates can just assume this.

Graduate students should prove this inequality. I recommend the
following approach. Define < x, y > to be the standard dot product ∑ x_i y_i.
Prove the Schwarz Inequality |< x, y >| ≤ ||x|| ||y||. The required
inequality should follow from this by noticing that ||x + y||^2 =< x + y, x + y >.
To prove the Schwarz inequality, notice that the following expression
is nonnegative:

\[ \langle x - \frac{< x, y >}{||y||^2} y, x - \frac{< x, y >}{||y||^2} y \rangle \]