Exercise 1. Product metrics

Let (X, d_X) and (Y, d_Y) be metric spaces. Show that we can define the following metric on the Cartesian product $X \times Y$:

$$d((x_1, y_1), (x_2, y_2)) := \max \{d_X(x_1, x_2), d_Y(y_1, y_2)\}$$

We call this the product metric *on $X \times Y$.*