Math 248: Lab 1

August 26, 2025

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1 Let $(x_1, y_1), (x_2, y_2)$, and (x_3, y_3) be the vertices of a triangle.

1.0.1 [3 pts] Let a, b, c represent the lengths of each of the sides. Draw a labeled picture of this triangle, including all the labels for the vertices and the sides.

Let $p_1 = (x_1, y_1), p_2 = (x_2, y_2), p_3 = (x_3, y_3)$.

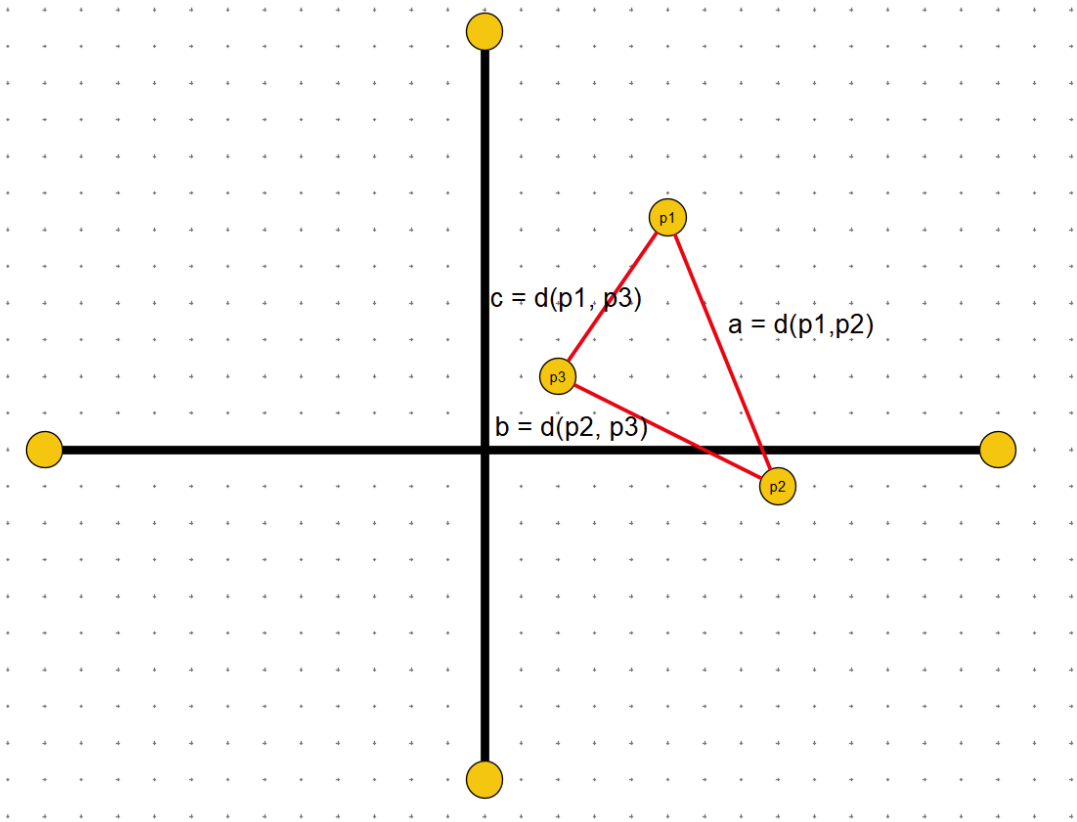

Figure 1: Triangle diagram

1.0.2 [6 pts] Create mathematical formulas for the length of each side in terms of the vertices.

Let p_i be any pair, $p_i = (x_i, y_i)$, and let d be the Euclidean distance metric over $\mathbb{R}^2$, defined by

$$d(p_i, p_j) = \sqrt{(x_j - x_i)^2 + (y_j - y_i)^2}. \tag{1}$$

Then, the length of each side, respectively is,

- $a = d(p_1, p_2) = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
- $b = d(p_2, p_3) = \sqrt{(x_3 - x_2)^2 + (y_3 - y_2)^2}$
- $c = d(p_1, p_3) = \sqrt{(x_3 - x_1)^2 + (y_3 - y_1)^2}$

1.0.3 [1 pt] Create a mathematical formula for calculating the perimeter, P, of the triangle in terms of $a, b,$ and c.

If a, b, and c are the lengths of each side, then,

$$P = a + b + c \tag{2}$$

$$= d(p_1, p_2) + d(p_2, p_3) + d(p_1, p_3) \tag{3}$$

$$= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} + \sqrt{(x_3 - x_2)^2 + (y_3 - y_2)^2} + \sqrt{(x_3 - x_1)^2 + (y_3 - y_1)^2}. \tag{4}$$