

Self-exercise - SRU05

Response to questions

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1 Hint for A1-HA05

Example 1. Given the set $\mathcal{M} \in \mathbb{R}^2$ bounded by three points A , B , and C , as shown in Figure 1.

1. Examine the integral of a function $f(x, y)$ over set \mathcal{M} .
2. Compute the area of \mathcal{M} by setting $f(x, y) = 1$.

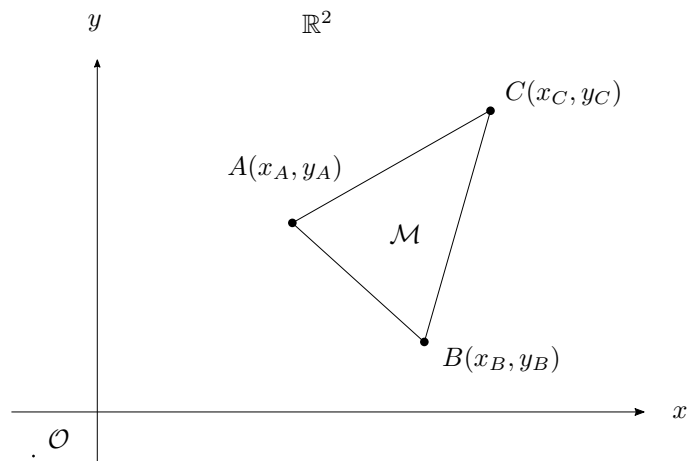


Figure 1: Set $\mathcal{M} \in \mathbb{R}^2$.

We will consider two scenarios

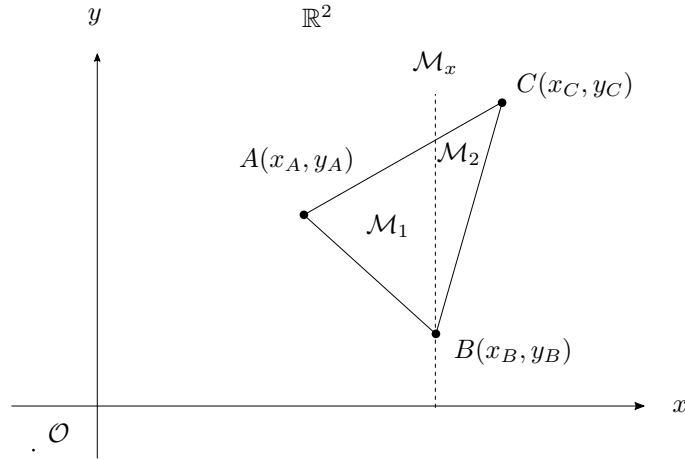


Figure 2: Set $M \in \mathbb{R}^2$.

Recall 1. Equation of a line (l) in general reads

$$(l) : y = ax + b, \quad (1)$$

where a is the slope of the line, and b is the point where the line (l) crosses over the vertical line of the axis. Hence, when this line (l) going through point $P(x_P, y_P)$ and point $Q(x_Q, y_Q)$, it leads to the following two relations

$$y_P = ax_P + b, \quad (2)$$

$$y_Q = ax_Q + b, \quad (3)$$

which leads to the slope a and vertical point b as follows

$$a = \frac{y_P - y_Q}{x_P - x_Q}, \quad (4)$$

$$b = \frac{-y_P x_Q + y_Q x_P}{x_P - x_Q}. \quad (5)$$

Finally, equation of a line (l) passing through point $P(x_P, y_P)$ and point $Q(x_Q, y_Q)$ in general takes the form

$$\therefore \boxed{y = \frac{y_P - y_Q}{x_P - x_Q} x + \frac{-y_P x_Q + y_Q x_P}{x_P - x_Q}}. \quad (6)$$