Self-exercise - SRU05
Response to questions

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19th November, 2022

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 $f(x, y) = 1$.*

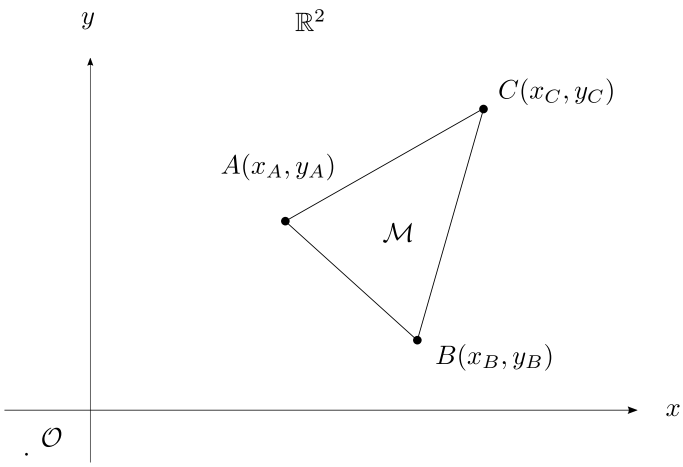

Figure 1: Set $M \in \mathbb{R}^2$.

We will consider two scenarios as depicted in Figure 2 and Figure 3.

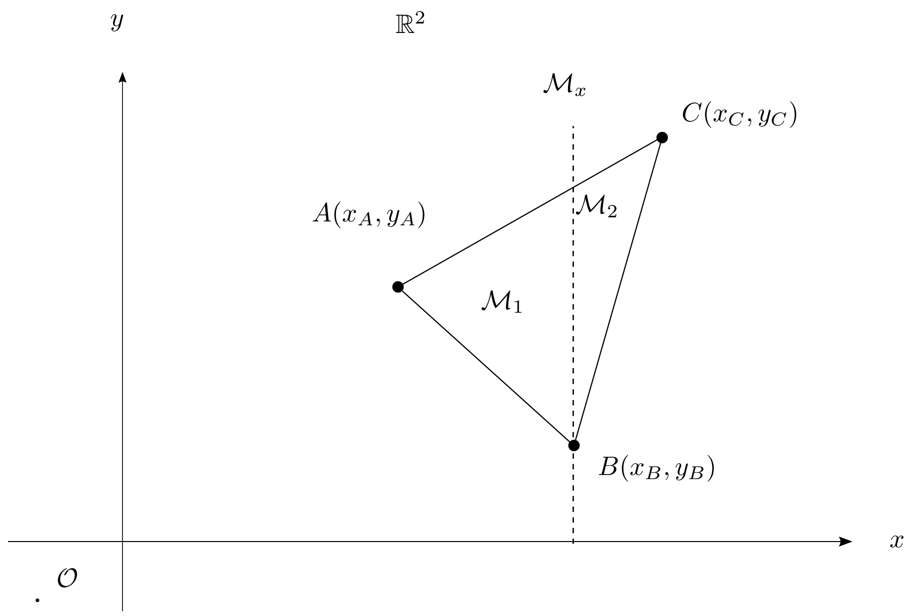

Figure 2: Set $\mathcal{M} \in \mathbb{R}^2$ and $\mathcal{M} = \mathcal{M}_1 \cup \mathcal{M}_2$ and split by $\mathcal{M}_x$.

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

$$(l): \quad y = a\,x + b, \tag{1}$$

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*

$$y_P = a\,x_P + b, \tag{2}$$

$$y_Q = a\,x_Q + b, \tag{3}$$

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

$$a = \frac{y_P - y_Q}{x_P - x_Q}, \tag{4}$$

$$b = \frac{-y_P\,x_Q + y_Q\,x_P}{x_P - x_Q}. \tag{5}$$

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*

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

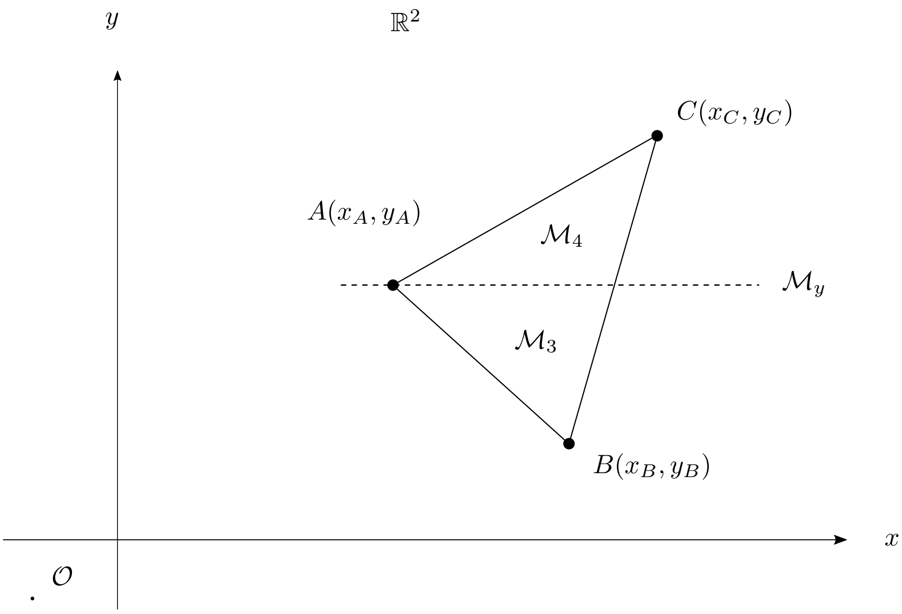

Figure 3: Set $\mathcal{M} \in \mathbb{R}^2$ split by $\mathcal{M}_y$.