

Answer Key 11

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p26

5 Negative.

Construct a discontinuous function $y_i = \begin{cases} \ln |\mathbf{x}|, & \mathbf{x} \neq \mathbf{0} \\ 0, & \mathbf{x} = \mathbf{0} \end{cases}$, $1 \leq i \leq m$ and evidently the preimage of a compact set is also compact \square

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3 For $\forall \varepsilon > 0$, the accumulation points can be covered by a finite set of closed rectangles with total volume $V_0 < \frac{\varepsilon}{2}$

\therefore If there are infinite points left in S , there will be an arbitrarily small region containing infinite points in S outside previous rectangles, which contradicts to the fact that all accumulation points are already covered.

\therefore The left points could be covered by another finite set of closed rectangles with total volume $V_1 < \frac{\varepsilon}{2}$ \square

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4 Negative.

Let $f_n(x) = [R(x)]^{\frac{1}{n}} \rightarrow D(x)$, $R(x)$ is Riemann function and $D(x)$ is Dirichlet function

Evidently $f_n(x)$ is integrable while $D(x)$ is not

□