

四川师范大学数学与软件科学学院数学与应用数学专业
2005—2006 学年度第二学期期末考试

《拓扑学》试卷三

答卷说明：本试卷共 4 页，5 个大题，满分 100 分，120 分钟完卷。

题号	一	二	三	四	五	总分	总分人
分数							

得分	评卷人

一. (15 points) (i) State the definition of a topology on a set X . (ii) Let X be a topological space and K be a subset of X . Assume that for every $x \in K$, there is an open set U such that $x \in U \subset K$. Show that K is open in X .

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- 二. (15 points) Let f be a continuous map from a topological space X to a topological space Y and h be a continuous map from Y to a topological space Z . Prove that the composite map $h \circ f$ is continuous on X .

得分	评卷人

- 三. (20 points) Let $\{K_\alpha : \alpha \in \Lambda\}$ be a collection of connected subspaces of a topological space X . Prove that if there is $\beta \in \Lambda$ such that for all $\alpha \in \Lambda$, $K_\alpha \cap K_\beta \neq \emptyset$, then $\bigcup_{\alpha \in \Lambda} K_\alpha$ is connected in X .

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四. (20 points) Let Y be a subspace of a Hausdorff topological space X and x be not in Y . Prove that if Y is compact in X , then there exist disjoint open sets U and V such that $x \in U$ and $Y \subset V$.

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五. (30 points) Let (X, d) be a metric space and K be a subset of X . Prove that

(i) The collection $\{B(x, r) : x \in X, r > 0\}$ is a basis for a topology on X ;

(ii) $x_n \rightarrow x \Leftrightarrow \forall \varepsilon > 0, \exists N$, when $n > N$, $d(x_n, x) < \varepsilon$;

(iii) x belongs to the closure of K if and only if there exists a sequence of points of K converging to x .