**臺北巿立教育大學**

**102學年度學士班二、三年級轉學生招生考試試題**

**系 別：**數學系（三年級）

不得使用計算機或任何儀具。

**科 目：**高等微積分

**考試時間：**90分鐘【8:20−9:50】

**總 分：**100分

* **注意：**不必抄題，作答時請將試題題號及答案依照順序寫在答卷上；**限用藍色或黑色筆作答**，使用其他顏色或鉛筆作答者，所考科目以零分計算。**(於本試題紙上作答者，不予計分。)**
1. (10%)Prove that the unit interval (0, 1) in *R* is uncountable.
2. (20%)Let *M* be a metric space, *A* and *B* be two subsets of *M*, and cl(*A*) denote the closure of *A*.
	1. Prove that *A* is closed if and only if the accumulation points of *A* belong to *A*.
	2. Is it true that cl(*A*$∩$*B*)=cl(*A*)$∩$cl(*B*)? why?
3. (10%)Let *f: A*→*N* be continuous and let *K*$⊂ $*A* be a compact set. Show that *f* is uniform continuous on *K*.
4. (10%)Show that the series$ \sum\_{k=1}^{\infty }\frac{(sinkx)^{2}}{k^{2}} $converges uniformly on *R.*
5. (10%)Let  be a compact metric space and be such that  for all ,  Prove that  has a unique fixed point.
6. (10%)Let be a sequence in **R**. Assume that  and for . Prove that converges.
7. (10%)Find the maximum of  under the restriction .
8. (10%)Prove that if  is connected in a metric space , then the closure of  is connected.
9. (10%)Let be a convergent sequence in  and define  and . Prove that converges to the same limit as , which in turn is the same as the limit of .