

COMPUTER SCIENCE TRIPOS Part IA – 2019 – Paper 2

9 Discrete Mathematics (gw104)

- (a) What does it mean for a function to be an injection, a surjection, and a bijection?  
[4 marks]
- (b) For sets  $A$  and  $B$ , define without proof a bijection from  $\mathcal{P}(A \times B)$  to  $[A \Rightarrow \mathcal{P}(B)]$  and its inverse.  
[4 marks]
- (c) For sets  $A$ ,  $B$  and  $C$ , define without proof a bijection from  $[(A \times B) \Rightarrow C]$  to  $[A \Rightarrow (B \Rightarrow C)]$  and its inverse.  
[4 marks]
- (d) Let  $X$  be a set. Prove there is no injection  $f : \mathcal{P}(X) \rightarrow X$ .  
[Hint: Consider the set  $W = \{f(Z) \mid Z \subseteq X \wedge f(Z) \notin Z\}$ .]  
[8 marks]