1. Let \( X \) and \( Y \) be metric spaces; make \( X \times Y \) into a metric space ‘as usual’. Prove that \( X \times Y \) is sequentially compact precisely when \( X \) and \( Y \) are sequentially compact.

2. (i) Prove that if \( (a_n)_{n=0}^{\infty} \) is a Cauchy sequence with a convergent subsequence, then \( (a_n)_{n=0}^{\infty} \) converges.

   (ii) Prove that each compact metric space is complete.

3. Prove that:

   (i) each complete subspace of any metric space is closed;

   (ii) each closed subset of any complete metric space is complete.