

1. Prove that the subset $\{(1, 0, 0, 0, 0, \dots), (0, 1, 0, 0, 0, \dots), (0, 0, 1, 0, 0, \dots), \dots\}$ of $[0, 1]^{\mathbb{N}}$ under its uniform topology does not have any accumulation point. (Hence, $[0, 1]^{\mathbb{N}}$ under its uniform topology is not limit point compact.)
2. Prove that every compact subset of a metric space is bounded and closed. Is the converse true? Justify your answer.