Homework Set 2.

1. Give an argument that shows (i.e. prove) that if A is a compact, while B is a closed set of $\mathbf{C}$, and $B \subset A$, then B is also compact.

2. Are the following subsets of $\mathbf{R}^2$ connected?

$$A = \{(x, y) \mid x, y \in \mathbf{Q}\}$$

$$B = \{(x, y) \mid x \in \mathbf{Q} \text{ or } y \in \mathbf{Q}\}$$

$$C = \{(x, y) \mid x, y \in \mathbf{Q} \text{ or } x, y \in \mathbf{R} \setminus \mathbf{Q}\}$$

3. Finish and write up the proof of the following lemma: if A is an open, connected subset of the complex numbers $\mathbf{C}$, then it is also path-connected.

Extra Credit Show that every open cover of $\mathbf{R}^2$ has a countable subcover.