11. a) $\mathbb{Q}$ is the set of rational numbers
   i) neither
   ii) not connected since $\mathbb{Q} = (-\infty, 0) \cup (0, \infty)$
   iii) not compact since $\mathbb{Q}$ is not closed
   iv) $\text{lim} \text{ pt of } \mathbb{Q} = \mathbb{R}$
   v) $\text{int} (A) = \emptyset$
   vi) $\overline{A} = \mathbb{R}$
   vii) $\partial A = \mathbb{R}$

All using the corresponding definition.

12. Let $A \subseteq \mathbb{R}$ and $E$ be the set of lim pts of $A$.

   WTS: $E$ is closed. Sufficient to show that $E$ contains all of its lim pts.
   i) If $E$ is finite, then the proof is trivial. Enumerate the elements of $E$ and show that every element is a boundary pt of $E$.
   ii) Assume $E$ contains infinitely many lim. pts. of $A$.
       It is sufficient to show that $E$ contains all of its lim pts.
   iii) Let $L$ be a lim. pt of $E$. $\forall \varepsilon > 0$, $(L - \varepsilon, L + \varepsilon)$ contains infinitely many elements of $E$.
        \[ \exists x \]
   iv) But each element of $E$ is a lim. pt of $A$. Hence, $\forall \varepsilon > 0$, the are infinitely many elements of $A$ in $(x - \varepsilon, x + \varepsilon)$, which implies that every $\varepsilon$ neighborhood of $L$ contains infinitely many pts of $A$. $\therefore L$ is a lim pt of $A \Rightarrow L \in E$. \[ \square \]