97. Work on Problem 3 of Section 9.1 in the textbook.

98. Let $M \subset \mathbb{R}^n$ be given. A subset $A \subseteq M$ is called *relatively open* if there exists an open set $B \subset \mathbb{R}^n$ with $A = M \cap B$. Show

(a) $M$ and $\emptyset$ are relatively open.
(b) The intersection of finitely many relatively open sets is relatively open.
(c) The union of arbitrarily many relatively open sets is relatively open.

99. For the following sets, find $M^o$, $\partial M$, and $\overline{M}$. Is $M$ open or closed? Graph $M$.

(a) $M = \left\{ (x, y) \in \mathbb{R}^2 : 1 \leq x^2 + y^2 \leq 4 \right\}$;
(b) $M = (a, b) \subset \mathbb{R}^n$;
(c) $M = \left\{ \begin{pmatrix} x \\ y \\ z \end{pmatrix} \in \mathbb{R}^3 : x - y - z = 2 \right\}$;
(d) $M = \left\{ \begin{pmatrix} x \\ y \\ z \end{pmatrix} \in \mathbb{R}^3 : x^2 + y^2 < z^2 \right\}$.

100. Work on Problem 4 of Section 9.1 in the textbook.

101. Work on Problem 5 of Section 9.1 in the textbook.

102. Let $M \subset \mathbb{R}^n$. Show

(a) $\overline{M}^o \subseteq \overline{M}$;
(b) $M^o \subseteq (\overline{M})^o$;
(c) $\partial(M^o) \subseteq \partial M$.

103. Show that the ‘$\subseteq$’ signs in # 102 can in general not be replaced by ‘$=$’ signs.

104. Let $M_1, M_2 \subset \mathbb{R}^n$. Show

(a) $(M_1 \cap M_2)^o = M_1^o \cap M_2^o$;
(b) $(M_1 \cup M_2)^o \supseteq M_1^o \cup M_2^o$.

105. Work on Problem 8 of Section 9.1 in the textbook.