Homework assignment, September 21, 2007.

1. Find interior, closure and boundary for the following sets

   a) $\{x \in \mathbb{R}^d : 0 < \rho(x, 0) \leq 1\}$;

   b) $\{x \in \mathbb{R}^d : \rho(x, 0) = a, a > 0\}$;

   c) Rational numbers contained in the interval $[0, 1]$ in $\mathbb{R}$;

   d) Graph of the function $y = \sin(1/x)$ $(x \in \mathbb{R} \setminus \{0\})$ in $\mathbb{R}^2$;

   e) Complement of the graph of the function $y = \sin(1/x)$ $(x \in \mathbb{R} \setminus \{0\})$ in $\mathbb{R}^2$;

   f) $\mathbb{R}^3 \setminus \{(1/n, 0, 0)\}_{n=1}^{\infty}$ (in $\mathbb{R}^3$).

   g) $\{(r\cos\theta, r\sin\theta) : 0 < r < 1, 0 < \theta < 2\pi\}$;

   h) $\{(x, y) \in \mathbb{R}^2 : x, y \text{ are rational}\}$;

2. Show that

   a) $\text{int}(A \cap B) = (\text{int } A) \cap (\text{int } B)$;

   b) $\text{cl}(A \cup B) = \text{cl } A \cup \text{cl } B$;

3. Show by example that the following statements are in general false

   a) $\text{int}(\text{cl } A) = \text{int } A$;

   b) $\partial(\partial A) = \partial A$;