1. (A function space) This problem is essentially the same as Th. 12.3, pp. 315–316.

2. (Topology of a metric space) Mimic the proofs for $\mathbb{R}^n$.

3. (Closure) (a) Use $X = \operatorname{int} A \cup \operatorname{bd} A \cup \operatorname{ext} A$.

   (b) See Exam 2 Review Problem # 2(c).

4. (Pointwise convergence) Use the comparison test for uniform convergence.

5. (Topology of a function space) See example posted on Canvas under Readings.

   (a) Let $f_k \in A$ and $f_k \to f$. Then

$$-x^2-1 \leq f_k(x) \leq x^2+1.$$

   Remember that the limit preserves $\leq$ (Lemma 2.21).

6. (Cauchy sequences) In this problem, c is the contraction constant for T, so $0 < c < 1$. Show that $\forall \varepsilon > 0, \exists K \in \mathbb{N}$ s.t. $\forall k \geq K$, $\left|\frac{c^k}{1-c}\right| < \frac{\varepsilon}{d(T(P_0), P_0)}$.

7. (c) $f(x,y) = (-y, x)$ is the counterclockwise rotation through 90° since $\begin{bmatrix} x \\ y \end{bmatrix} \cdot \begin{bmatrix} -y \\ x \end{bmatrix} = -xy + yx = 0$.

8. Use the comparison test for uniform convergence.

(End of hints)