1. Problem 17–1 of Lee on page 464.

2. Suppose $S$ is an embedded submanifold of $M$. A retract is a smooth map $R: M \to S$ which is the identity on $S$. Prove that $R^*: H^*(S) \to H^*(M)$ is injective.

3. Let $M = M_1 \times M_2$ and let $P_i: M \to M_i$ be the natural projections.
   
   Prove or disprove: Each $P_i^*: H^*(M_i) \to H^*(M)$ is injective.

4. Let $\Omega^*_c(M)$ denote the subalgebra of differential forms with compact support.
   
   (a) Show you can define $H^*_c(M)$ using $\Omega^*_c(M)$ analogously to how $H^*(M)$ is defined from $\Omega^*(M)$.
   
   (b) If $M$ is connected and non-compact, prove that $H^0_c(M) = 0$.
   
   (c) Prove or disprove: A smooth map $F: M \to N$ induces a homomorphism $F^*: H^*_c(N) \to H^*_c(M)$.

5. In the notes for Wednesday, November 18, complete the proof of the Homotopy Operator Lemma in the case of $\beta = f(x,t) \, dt \wedge dx_1 \wedge \cdots \wedge dx_{k-1}$; see the bottom of page 5 for details.