Study problems for second midterm, not to turn in

Math 327C/574C

1. Use the Dirichlet Test to prove the Alternating Series Test for convergence of a series.

2. Prove or disprove: if $f : \mathbb{R} \to \mathbb{R}$ is continuous and $C \subset \mathbb{R}$ is compact, then the inverse image $f^{-1}(C)$ is also compact. (That is, if this statement is true, then prove it; if not, then give a counterexample.)

3. Determine the radius of convergence of the power series $\sum_{n=1}^{\infty} \frac{x^n}{n^3}$ and show that it defines a continuous function on a suitable interval in the real line. Do *not* try to evaluate the sum.

4. Define carefully what it means for a sequence f_n of real-valued functions on interval $[a, b]$ to converge uniformly to a function f on $[a, b]$. If the f_n are continuous, then what can you say about f?

5. Multiply the power series for e^x by the series for e^y and verify that you get the series for e^{x+y}.

The midterm will cover the convergence test for series and Chapters 3-6.