Analysis Boot Camp Outline

I. Metric Spaces
   (a) Definitions: open sets, closed sets, etc.
   (b) Properties: Completeness, Connectedness, etc.
   (c) Compact Sets: Bolzano-Weierstrass v. Heine-Borel

II. Continuous Functions (between Metric Spaces)
   (a) Equivalent Definitions (\( \epsilon - \delta \), sequential, \( f^{-1}(O) \) is open)
   (b) Images of Connected Sets, Compact Sets
   (c) The Metric Space \( C(X) \)
   (d) Compactness of Sets of Continuous Functions (Arzela-Ascoli)
   (e) Contraction Mappings on Subsets of \( C(X) \).

III. Differentiation of Functions Mapping Subsets of \( \mathbb{R}^m \) into \( \mathbb{R}^n \)
   (a) Definition of Differentiability, Sufficient Conditions for Differentiability
   (b) The Chain Rule
   (c) Taylor Series (in Several Variables)
   (d) The Inverse and Implicit Function Theorems

IV. Sequences and Series
   (a) Definitions of Convergence and Convergence Tests
   (b) Power Series
   (c) Fourier Series