

Material on the MA 732 Final

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1. Showing something is a Banach space (homework due Jan. 23, problem 1).
2. Use of Contraction Mapping Theorem (proof in notes of first Existence-Uniqueness Theorem).
3. Using the definitions of bounded linear map, derivative, C^1 (proof in notes that the map $N : C^0([a, b], R^n) \rightarrow C^0([a, b], R^m)$ defined by $N(\phi) = f \circ \phi$, where $f : R^n \rightarrow R^m$ is C^1 , is C^1 ; homework due Feb. 13, problem 1).
4. Using the product norm (homework due Feb. 13, problem 2).
5. Using the Chain Rule and Product Rule (homework due Feb. 13, last two problems).
6. Using the Contraction Mapping Theorem with Parameters and the Mean Value Theorem (homework due Feb. 27, problem 1).
7. Proof of the Stable Manifold Theorem (setting up a contraction mapping, proving it is a contraction, appealing to the Contraction Mapping Theorem with Parameters, and the related homework due Mar. 17, problem 1).
8. Center manifold calculations (homework due Apr. 2, problems 1, 2, 3 and 4).
9. Proofs for saddle-node, transcritical, pitchfork bifurcations, saddle-node bifurcation for maps (lecture, homework due Apr. 2, problems 5, 6).
10. Bifurcation problems using center manifold reduction (homework due Apr. 16, problems 1 and 2).