

**MA771 - Fall 2020 Homework 1 - Due Friday, September 25th**

Please scan or type your homework and email it to me by the due date. Homeworks will be graded electronically and emailed back to you.

**Barreira and Valls Problems**

*Chapter 2:* 1,3, 9,11,13

*Chapter 3:* 6,9,12

**Additional Problems :**

*Problem 1:* Let  $f : X \rightarrow X$  be a topological dynamical system with  $f$  **an open map**. Prove that  $f$  is topologically transitive if and only if there are no two disjoint sets in  $X$  which are both open, non-empty, and  $f$ -invariant.

*Problem 2:* Let  $f : X \rightarrow X$  be a topological dynamical system with topology-generating metric  $d$ . Show that if  $f$  preserves the metric, that is  $d(f(x), f(y)) = d(x, y)$  for all  $x, y \in X$ , then  $f$  is not topologically mixing.

**Optional Problem:** Let  $T_A : \mathbb{T}^n \rightarrow \mathbb{T}^n$  be a toral endomorphism with  $\det A = \pm 1$ . Show that  $T_A$  has finitely many periodic orbits **of each period** if and only if no eigenvalue  $\lambda$  of  $A$  is a root of unity.