

**MATH 241: ANALYSIS IN SEVERAL REAL VARIABLES I**  
**WORKSHEET, DAY #29**

**Theorem.** *Let  $f : K \rightarrow \mathbb{R}$  be continuous on a compact set  $K$ . Then  $f(K)$  is compact.*

We will use the above theorem to prove the Extreme Value Theorem.

**Theorem** (Extreme Value Theorem). *If  $f : K \rightarrow \mathbb{R}$  is continuous on a compact set  $K \subset \mathbb{R}$ , then  $f$  attains a maximum and minimum value.*

**Problem 1.**

(a) Let  $K$  be compact. Show that  $K$  has a maximum and a minimum.

(b) Use the above theorem to show there exists  $x_0, x_1 \in K$  such that  $f(K) \subset [f(x_0), f(x_1)]$ .