

## Extreme Values of Functions (4.1)

### Expected Skills.

At the end of this section, students will be able to:

- define the notions of local/absolute min and max, and critical point,
- explain the extreme value theorem (in particular its hypotheses) and exhibit “counter-examples”, i.e. functions that don’t have an absolute min or max,
- find the absolute min and max of a continuous function on a closed interval  $[a, b]$ .

**Pre-Class Activity** (ch4-applications-2-evt-1-pc). The goal of the pre-class activity is to have the students think about the conditions that will assure that a function has an (absolute) min and max. To do this, we have them analyze functions and ask them about their domains, continuity or discontinuity and the existence of minimum/maximum.

**Worksheet** (ch4-applications-2-evt-2-ws). We first continue the reflection initiated in the pre-class activity by having the students draw functions with specific properties. We then asked them about the conditions for a function to have a (global) minimum and maximum, i.e. we ask for the hypotheses of the Extreme Value Theorem.

In exercise 3, we have the students distinguish between the *hypotheses* and the *conclusion* of a theorem.

We then ask the students what would be a procedure to find the global min and max. It is also a good place to talk about local min and max.

Finally, exercises 6 and 7 are an application of the Extreme Value Theorem (and some modeling for 7).