UNIT 5: WORKSHEET

Last Sunday was Groundhog day. Punxsutawney Phil predicted the future, saw some shadow and predicts a couple of more winter weeks. We study here extrema and the intermediate value theorem.

The intermediate value theorem

1: Today, the average temperature is 40° Fahrenheit. Argue why there had been a moment in the last year, where the temperature had been exactly 50 degree Fahrenheit.

2: Argue why there was a time in your life whether you were 1000 times longer than your average teeth length.

3: Is there a point x, where

$$\frac{1}{\sin(x)} = \frac{1}{2} \ .$$

We have $1/\sin(\pi/2) = 1$ and $1/\sin(3\pi/2) = -1$. Why does the intermediate value theorem not give such a point?

4: The earth's diameter is 12'756 km in average. Is there a point on earth where the distance to its anti-pod is exactly 12'756 km?

5: The function $f(x) = x - \text{floor}(x)$ is called the **ground hog function**. If you know the movie with **Bill Murray**, you know why. Find an interval where the intermediate value theorem fails.

Feb 2   Feb 2   Feb 2