Lecture 5: Worksheet

Last Sunday was Groundhog day. Punxsatawney 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 37° Fahrenheit. Argue that there had been a moment this fall/winter where the temperature had been exactly 40 degree Fahrenheit.

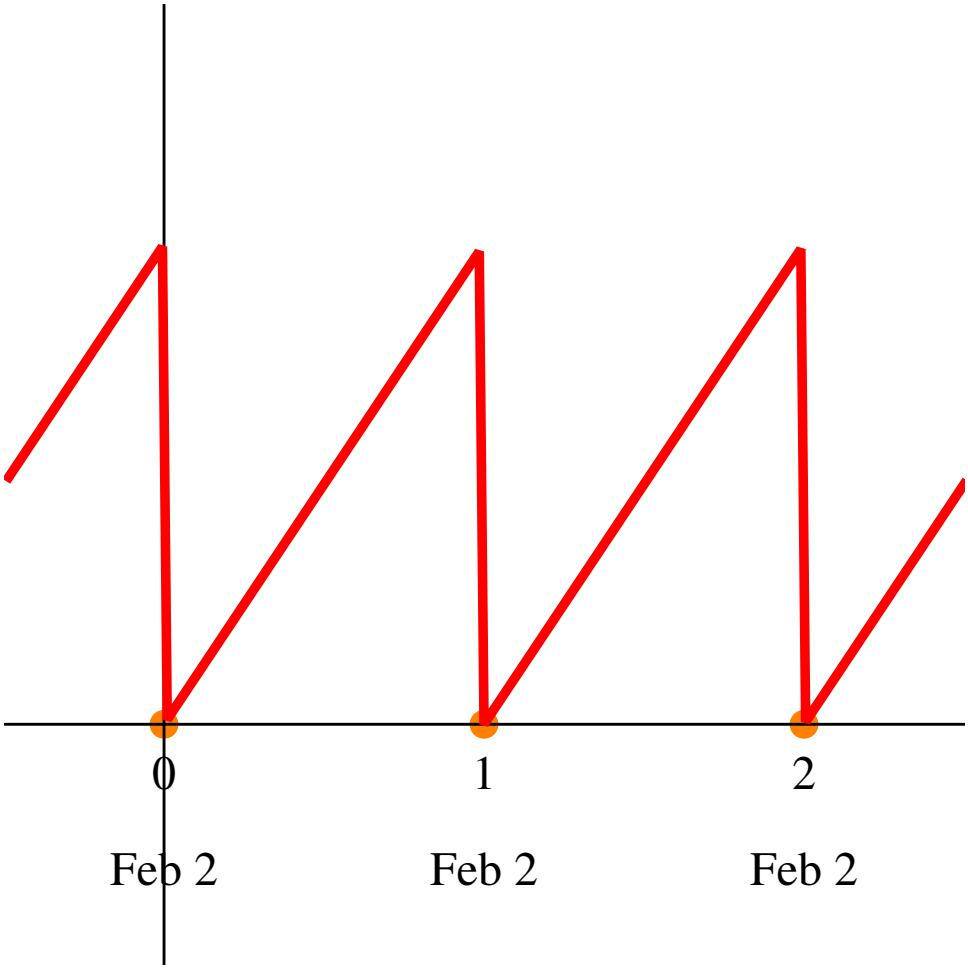
2 Is there a point x, where

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

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

3 The earth's diameter is 12'756 km in average. Is there a point on earth where the distance to its antipiode is exactly 12'756 km?

4 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.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