Introduction to Unbounded Optimization

- An Important Notice
- Overview
- Definitions and Vocabulary

An Important Notice

In this unit, you will be writing some useful programs with future applications.

Therefore, unless indicated, all of these programs *must be saved* so that they can be reused later. There will be reminders as well.

An Important Notice

When you save a program for later use, it becomes important to document your code. Remember you can document using a hashtag, #.

At minimum, explain:

1. At the top, what the program does
2. At the “function” line, what the input variables stand for
3. For any complicated equation or loop, what is happening

Unbounded Optimization

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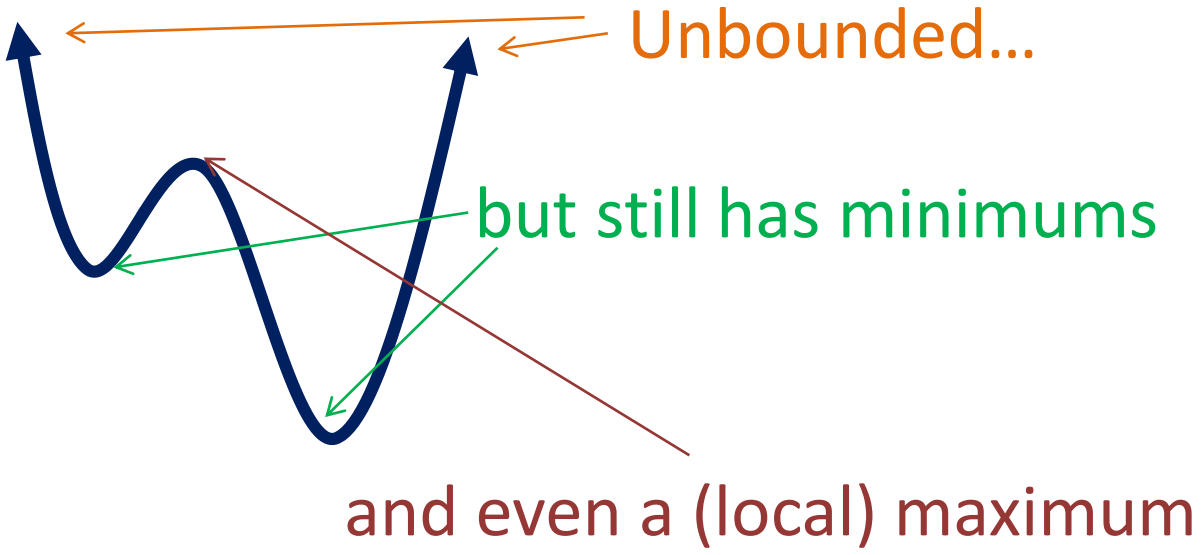

Local vs. Global Extremes

If a point is a maximum or minimum relative to the other points in its “neighborhood”, then it is considered a local maximum or local minimum.

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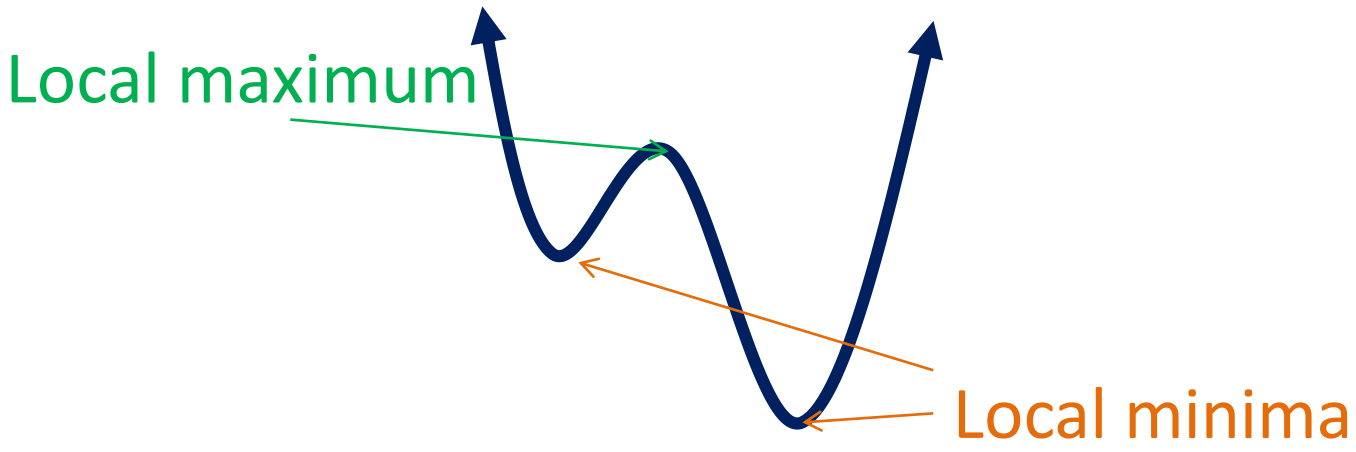
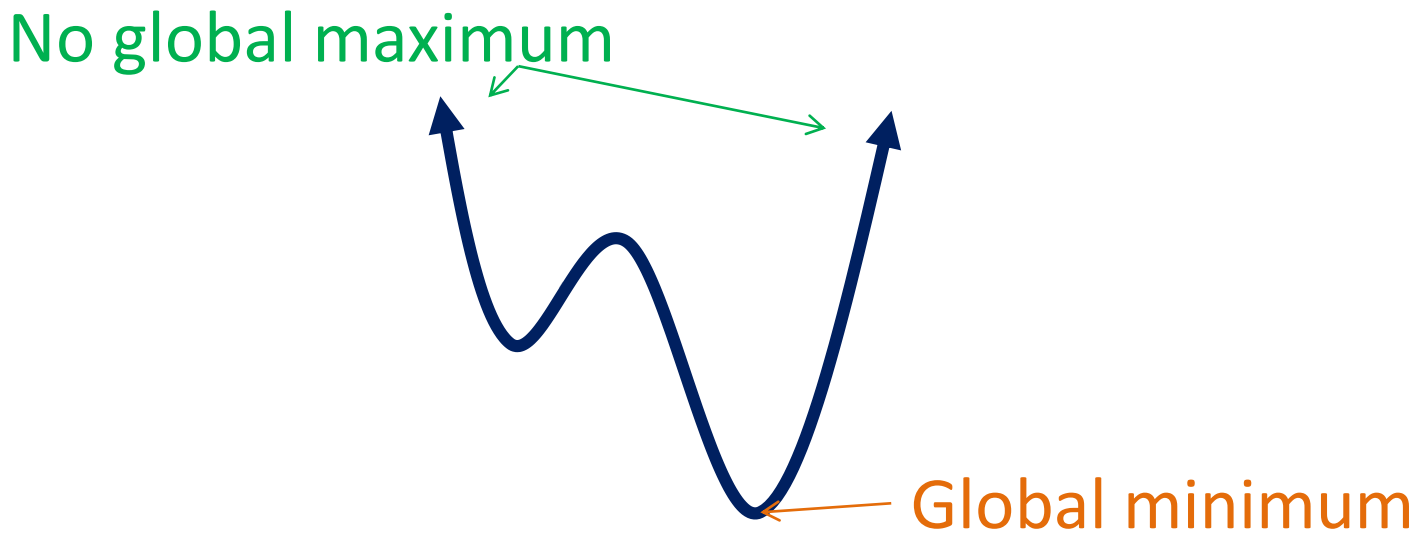


Local vs. Global Extremes

If a point is a maximum or minimum relative to all the other points on the function, then it is considered a global maximum or global minimum.



Practice Problems 1 and 2

1. Sketch a function with…

a) Two local maxima, one of which is global, one local minimum and no global minimum

b) No local or global extremes

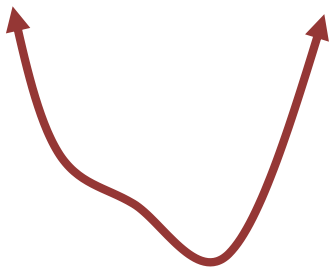
c) One global minimum and no maxima

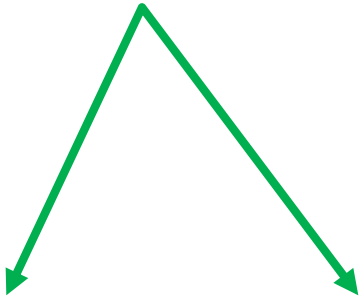
d) Two global minima, one local maximum, no global maximum

2. Write a set of conditions that would be impossible.

Unimodal and Multimodal Functions

A unimodal function has only one minimum and the rest of the graph goes up from there; or one maximum and the rest of the graph goes down.

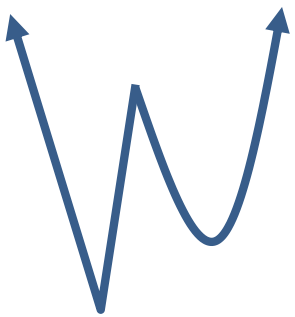


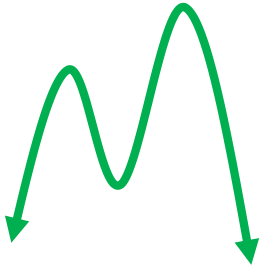


With unimodal functions, any extreme you find is guaranteed to be the global extreme.

Unimodal and Multimodal Functions

A bimodal function has two local minima or maxima.





Beyond that, trimodal, quadrimodal and then multimodal.

With bimodal and above, you don’t know if an extreme is local or global unless you know the entire graph.

Practice Problems 3 and 4

3. Draw a trimodal function with no global maximum. On your function label the local and global minima, and the local maxima.

4. If a smooth function has n modes with no global minimum, how many local maxima will it have? How many local minima will it have? How many total local extremes?