# Verification of Extreme Values

Another Application of Concavity

In a Calculus class, the use of concavity information is typically limited to finding inflection points for the purpose of curve sketching.

A far more useful application is for verifying the nature of critical points: whether a given critical point is a maximum or minimum.

Another Application of Concavity

In a typical curve-sketching problem, the behavior of the curve is well-known so the concavity is not very important. Function values and first derivatives give you everything you need.
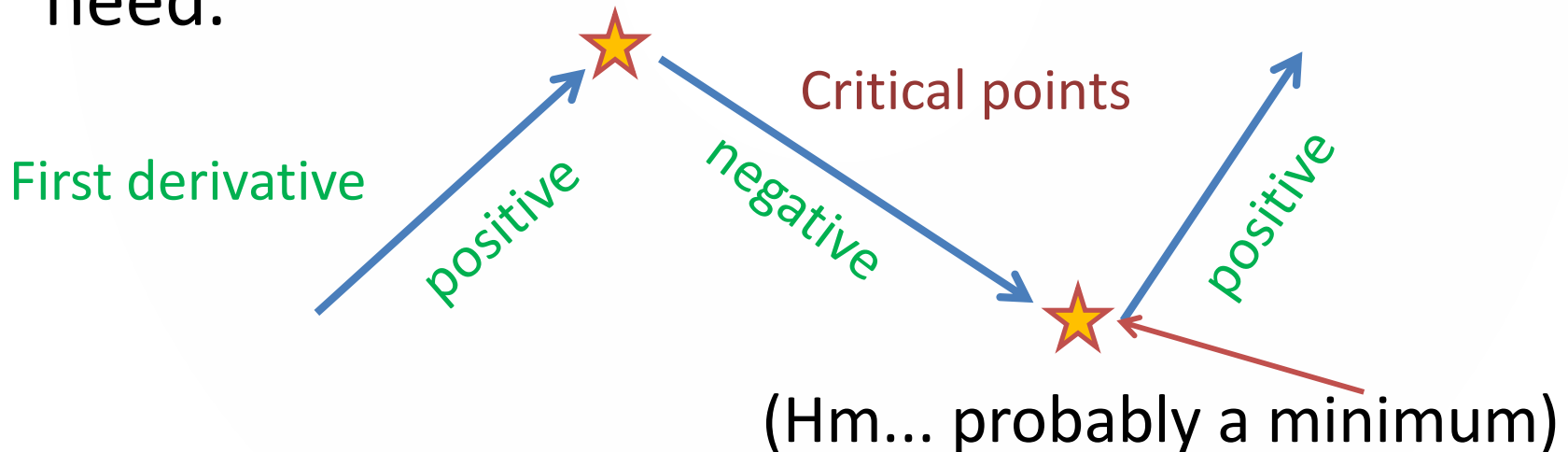
Critical points

First derivative

positive

negative

positive

(Hm… probably a minimum)

Another Application of Concavity

If less information is known about the function, the concavity becomes far more important.

⭐ Critical point

(Is this critical point a maximum or a minimum?)

Another Application of Concavity

If less information is known about the function, the concavity becomes far more important.

function is concave up = critical point is a minimum

function is concave down = critical point is a maximum
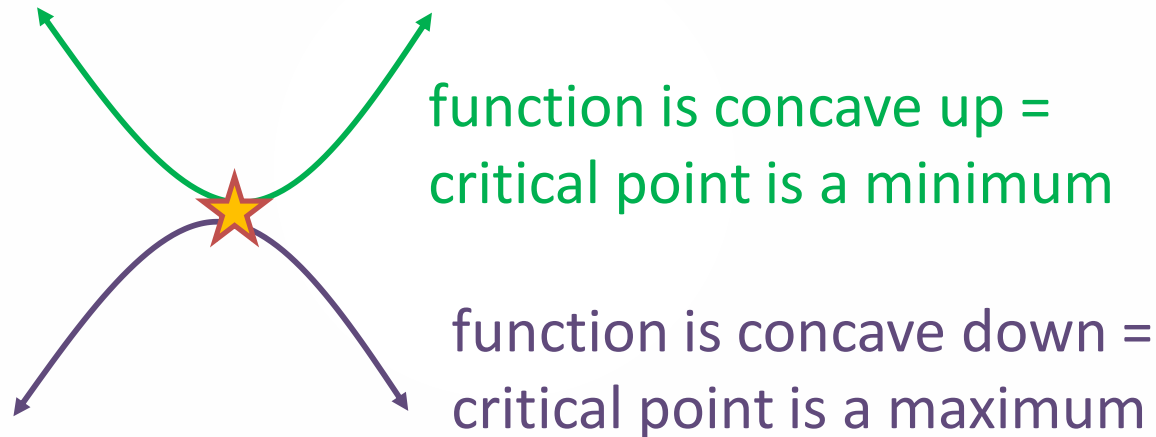
Another advantage is that we need only evaluate the second derivative *at* the critical point, not on both sides.

Practice Problem

Write a program using the Calculus package that uses first derivatives to locate critical points and second derivatives to verify whether those points are maxima or minima. Your program should report critical points as:

"Maximum at (__, __)", etc.

Test, save and document your code!