- **Curve Sketching:** Sketching polynomial functions; asymptotes, concave up and down functions, second derivative test; putting this together to sketch a graph of a function.

Main Part of class

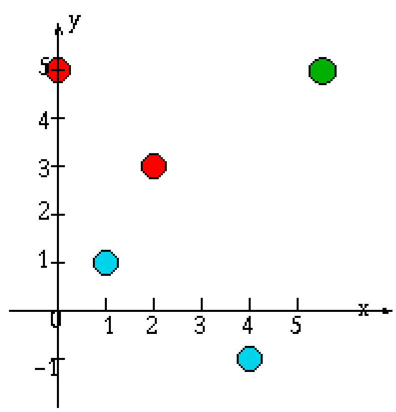
Max and Min:

Curve sketching

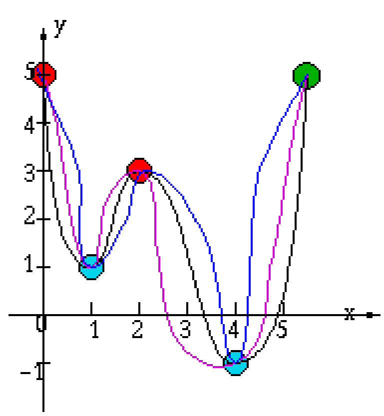
Case where nothing is infinite

Once you know where the maximum and minimum of a function over some range, then you've got a pretty good idea what the graph looks like. E.g., you've used the method described before to find max and min values of a function f(x), over some interval, e.g. say local maximum are at 0, 2, and local minimum at 1,4. Suppose you found values at these critical points, and at the boundary, as shown in the table below, and plot the points:

x	f(x)
0	5
1	1
2	3
4	-1
5	5

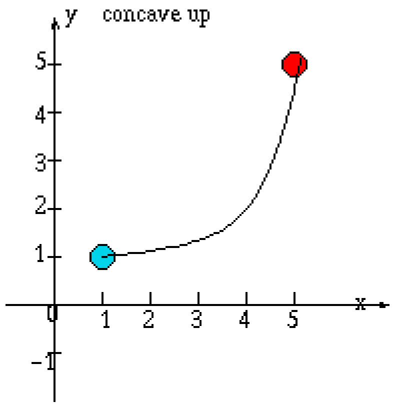


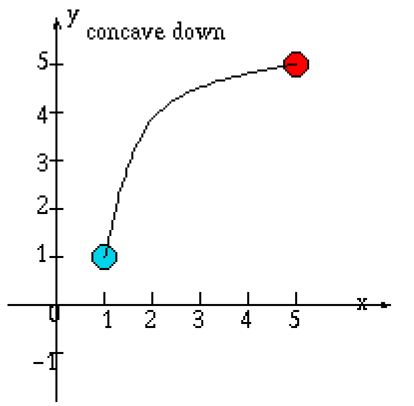
Now you can fill in between some how... But how do you know which of the following might be the way the curve fills in?



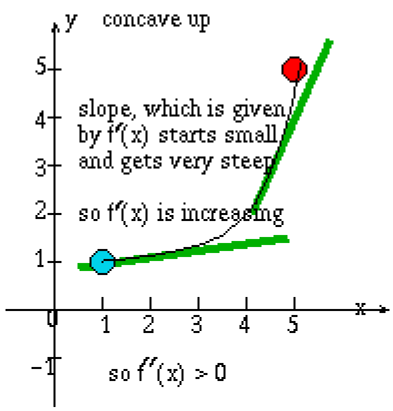
Different possible ways to "join the dots" drawn in different colors

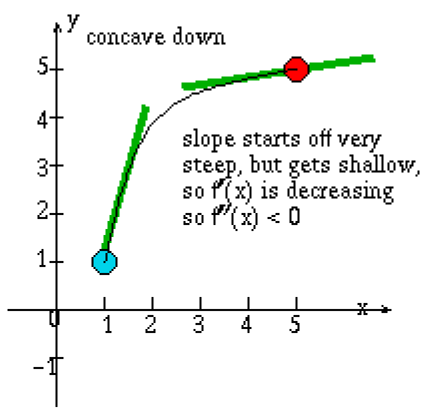
The idea is the difference between **concave up** and **cocave down**:





You can test for concave up or down by finding the second derivative:

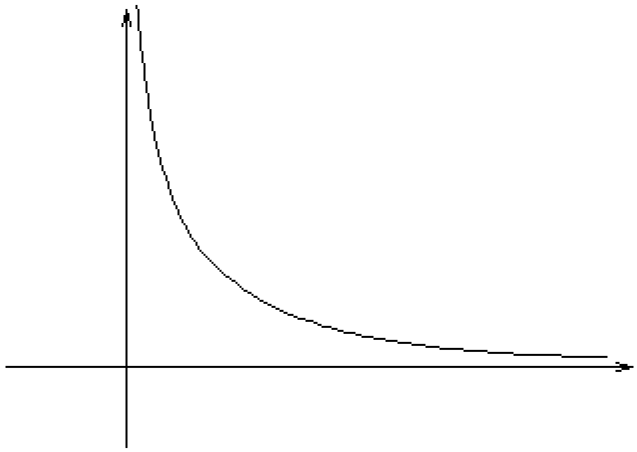




Case where something is infinite

Suppose you have something infinite, eg, you want to know what happens when x gets very big, even when x gets infinite... For example, suppose f(x) represents the amount of some chemical produced in some reaction. At the beginning, the amount of the chemical grows pretty quickly, but then the reaction slows down, and even if you leave it going forever, you'll never get more than say 7 grams of the chemical:

Another way you might get infinity is if the function has an infinite value, eg, f(x)=infinity for some x, eg, if f(x)=1/x, then f(0) = infinity:



This situation is described by **asymptotes**; these are the vertical or horizontal lines that tell you what the function is doing as either x or f(x) gets infinite: