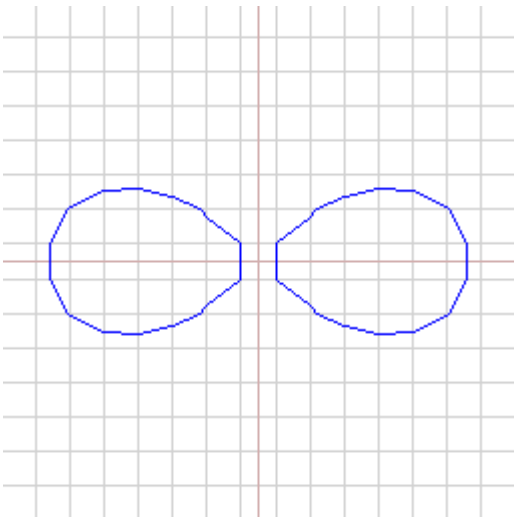
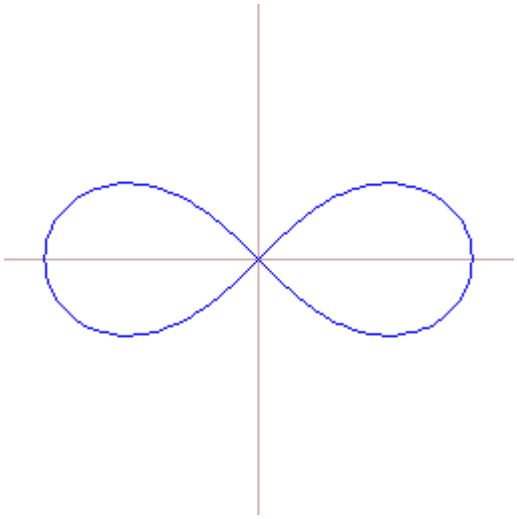
Contour Curves

This application graphs a level curve of a function *f* by splitting the graph window into smaller tiles, and graphing the planar approximation of *f* in each tile.

The test function used is the Bernouli lemiscate, $f(x, y)=(x^2+y^2)^2-x^2+y^2$



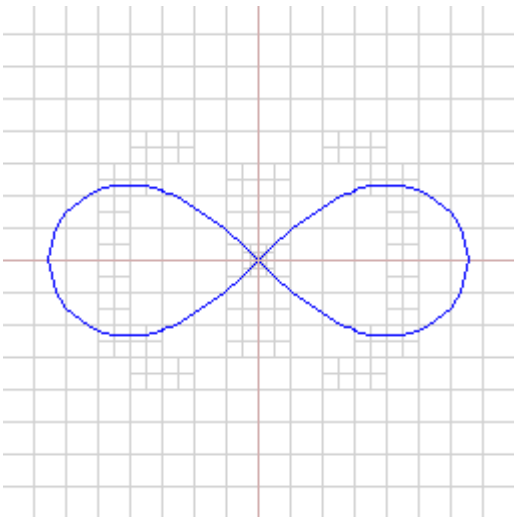
Fixed grid size (15x15)



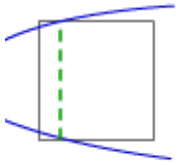
Fixed grid size (50x50)

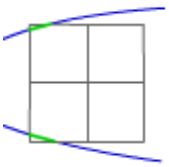
At the (0, 0), this method can encounter a problem, because this is a degenerate point. This can be resolved by using smaller tiles; however, this increases the computation time required. In the examples above, the first graph uses 225 tiles. The second is more accurate, but it uses 2,500 tiles. Since many of these high-precision areas do not even contain any part of the graph, simply adding more tiles results in wasted effort.

A quicker procedure is to predict which tiles will be most troublesome, and break them up into smaller ones. Critical points and areas of large curvature are surrounded by smaller tiles where increased precision is necessary.



Adaptive grid size





Another problem can occur when two segments of the contour curve overlap a tile, causing the algorithm to erroneously draw a line connecting them. This problem can also be sidestepped be breaking the tile into smaller pieces.