**Comparison performance on Killing example 1**

Consider the following optimization problem:

minimize\_x,y x2-y2 subjection x=y, x in [-1,1]

In Proposition 1 of this paper (Wang-Yin-Zeng’2019), we have the following known theoretical results:

1. ALM diverges for any bounded penalty parameter beta;
2. Original ADMM converges if beta>4;
3. LiMEAL converges if the proximal parameter gamma in (0,1/2), the step size eta in (0,2), the penalty parameter beta is sufficiently large, in particular, beta>4.

**Algorithm 1**: Augmented Lagrangian Method with beta = 50

Oscillate at these two points (x,y,lambda): (1,1.0869,-2.1739) and (-1,-1.0869,2.1739)

Color: read

objf=-0.1815

dual=0.087



**Algorithm 2**: LiMEAL with different parameters

Gamma = 1/2; beta = 50;

1. eta = 0.5; (m)
2. eta = 1; (k)
3. eta = 1.5. (b)

Three curves:

1. Objective function; 2) constraint violation; 3) iterative sequences

objfun=0





