

# Plots Practice

November 19, 2024

## 1 Convex and Non-convex functions

Methods for optimizing convex and non-convex functions can be quite different. Let's illustrate this with some plots.

Figure 1: Convex Function:  $x^2$ . Strongly convex functions have one global minima that is easy to find.

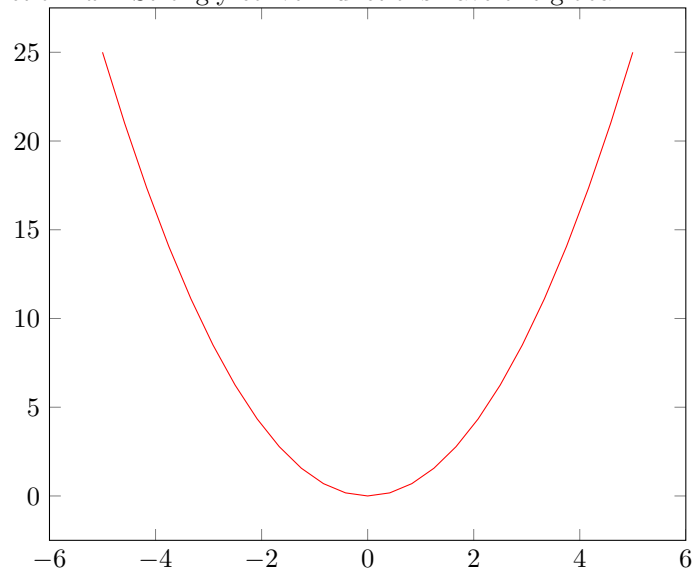
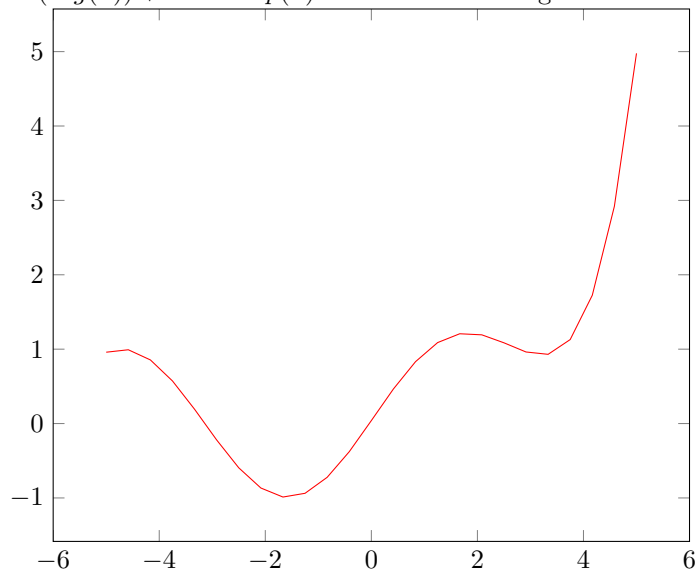
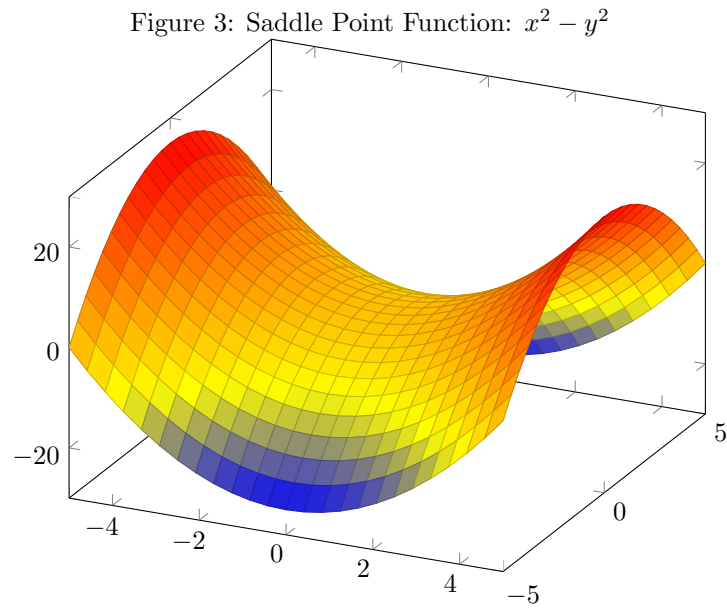


Figure 2: Non-convex Function:  $\sin(\deg(x)) + 0.04 * \exp(x)$  are harder to find global minima since there can be local minima.



## 2 Saddle Points

In higher dimensions, we have even more problems with optimization. One of these is saddle points where at least one dimensions is convex up and one dimension is concave down.



## 3 Plotting Data

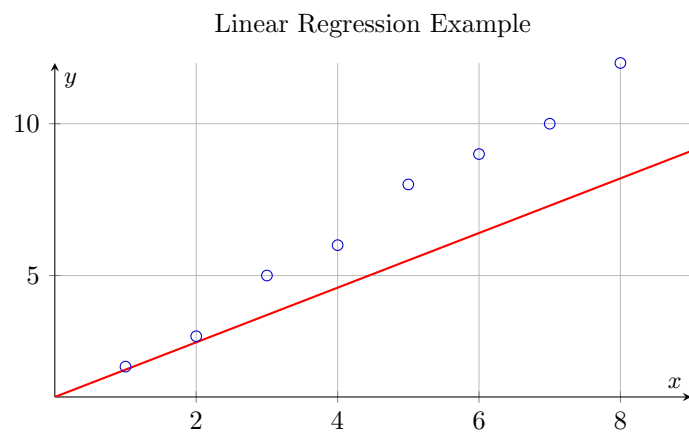


Figure 4: We plot the regression line  $y = 0.9 * x + 1$  over the following dataset: (1,2) (2,3) (3,5) (4,6) (5,8) (6,9) (7,10) (8,12)