Minimize $f_0(x)$
x is optimization variable
f_0 is an objective function
Optimization seeks to find the global minimum for an objective function, subject to constraints
Convex optimization
If the objective function is convex, the optimization problem is calle convex optimization
Example problem: $y = x^2 + 3$
Note that: derivative is 0 at

- local minimums
- local maximums
- global minimums
- global maximums

Take first derivative: $y' = 2x$
2nd derivative test: $y'' = 2$
If the 2nd derivative is positive, it is a minimum. Otherwise, it is a maximum
In the context of machine learning:

- Optimization is an iterative process
- The graient tells us which way to change our parameters

Problems with optimization

- Local minimums of the objective function
- All kinds of different constraints