Convex Optimization

Lab 2: Newton's Method-I and Newton's Method-II

Lecturer: *Dr*. Wan-Lei Zhao

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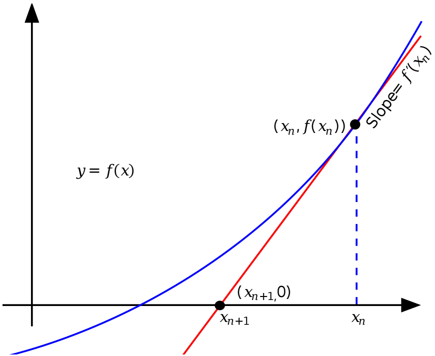
Contact: wlzhao@xmu.edu.cn

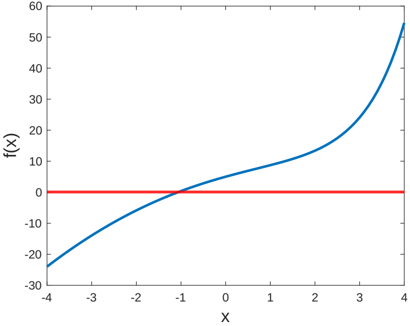
The **Newton's method-I** procedure

1. $x_n = x_o$
2. Repeat
   a. $x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$
   b. $x_n = x_{n+1}$
3. Until $f(x_n)$ close to 0



Practice with **Newton's method-I** (1)

- Solve $e^x - x^2 + 3x + 4 = 0$



- $f'(x) = e^x - 2x + 3$
- Notice that $f(x)$ is defined by ourselves

Practice with Newton's method (2)

- Try to solve following equations by **Newton's method-I**

$$e^x - x^2 + 3x + 4 = 0$$

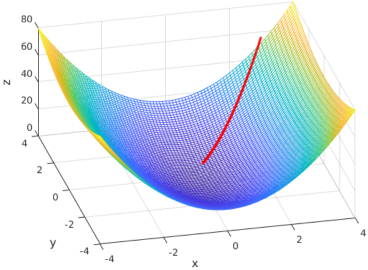
$$6sin(x) + 5x - 2 = 0$$

$$5x + lnx = 10000$$

The Newton's method-II procedure

1. $x_k = x_0$
2. Repeat
   a. $x_{k+1} = x_k - \frac{f'(x_k)}{f''(x_k)}$
   b. $x_k = x_{k+1}$
3. Until $| \, f(x_k) - f(x_{k+1}) \, |$ is close to 0

Practice with Newton's method (1)



1. Implementation of Newton's method-II in Section **??**, Algorithm **??**, try to implement Newton's method-II by MATLAB. Find the mininum for function $z = 4 * x^2 + y^2 + 5,\ x, y \in [-4,\ 4]$. The initial point the iteration is $x = 3, y = 4$.
2. Try to find the local minimal for function $z = x * y + y^2$, $x, y \in [-6,\ 6]$ by Newton's method-II. The initial point the iteration is $x = 2, y = 2$. See what happens