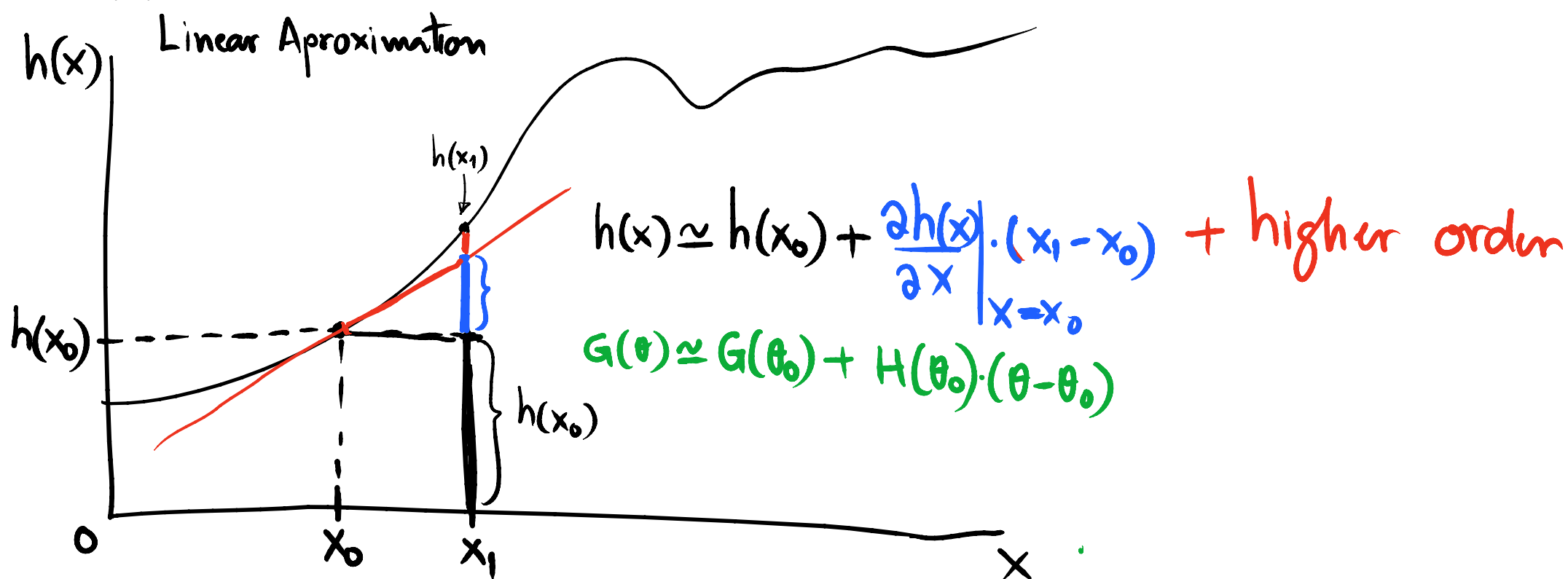




$$\theta = \begin{bmatrix} \theta_1 \\ \theta_2 \\ \vdots \\ \theta_k \end{bmatrix}, \text{ Gradient Matrix } G(\theta) = \frac{\partial L(\theta)}{\partial \theta} = \begin{bmatrix} \frac{\partial L(\theta)}{\partial \theta_1} \\ \frac{\partial L(\theta)}{\partial \theta_2} \\ \vdots \\ \frac{\partial L(\theta)}{\partial \theta_k} \end{bmatrix}_{k \times 1}$$

Hessian Matrix $H(\theta) = \frac{\partial^2 L(\theta)}{\partial \theta \partial \theta}$

$$= \begin{bmatrix} \frac{\partial^2 L(\theta)}{\partial \theta_1 \partial \theta_1} & \frac{\partial^2 L(\theta)}{\partial \theta_1 \partial \theta_2} & \dots & \frac{\partial^2 L(\theta)}{\partial \theta_1 \partial \theta_k} \\ \frac{\partial^2 L(\theta)}{\partial \theta_2 \partial \theta_1} & \frac{\partial^2 L(\theta)}{\partial \theta_2 \partial \theta_2} & \dots & \frac{\partial^2 L(\theta)}{\partial \theta_2 \partial \theta_k} \\ \vdots & \vdots & \ddots & \vdots \\ \frac{\partial^2 L(\theta)}{\partial \theta_k \partial \theta_1} & \frac{\partial^2 L(\theta)}{\partial \theta_k \partial \theta_2} & \dots & \frac{\partial^2 L(\theta)}{\partial \theta_k \partial \theta_k} \end{bmatrix}_{k \times k}$$

FOC

$$G(\theta) \simeq G(\theta_0) + H(\theta_0)(\theta - \theta_0) = 0$$

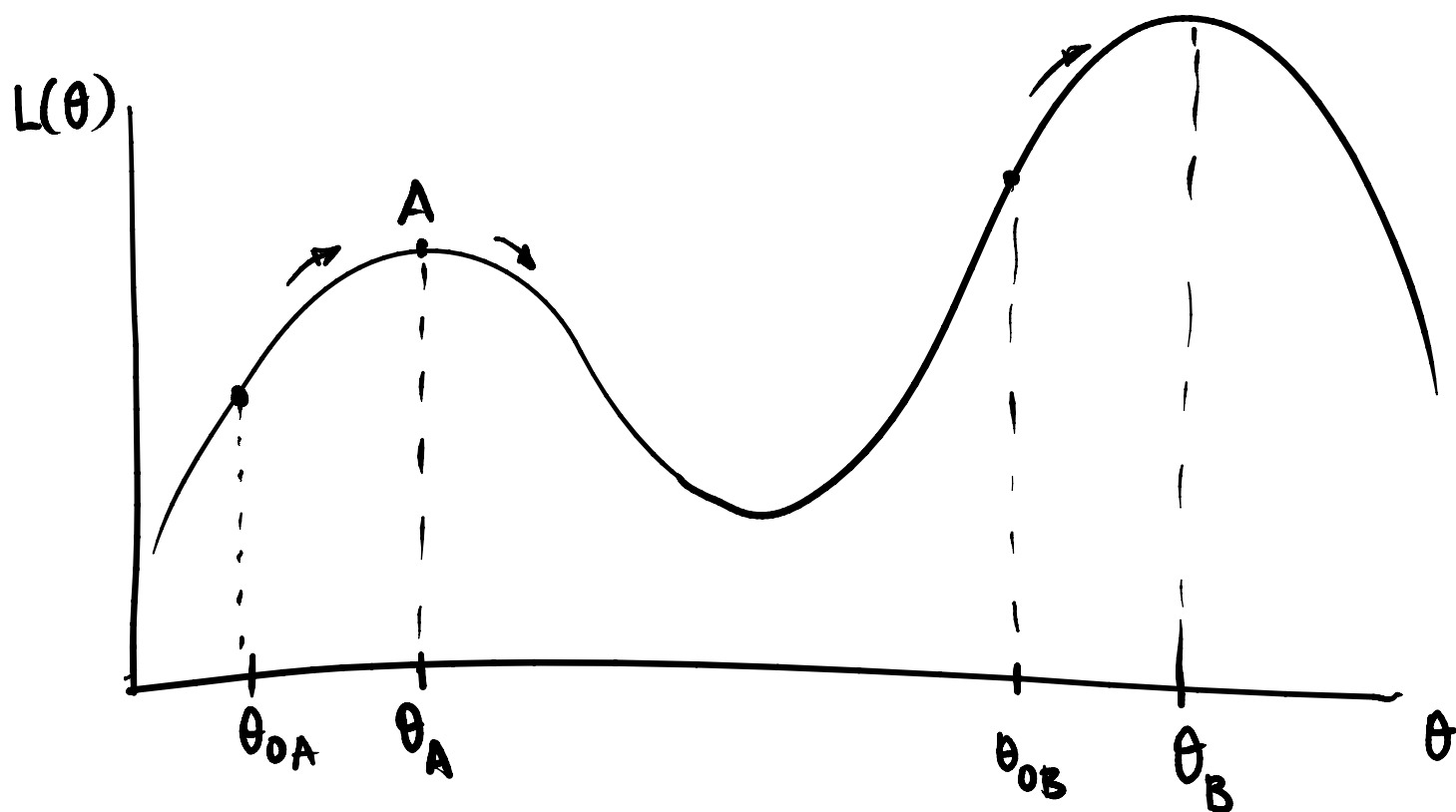
$$G(\theta) = G(\theta_0) + H(\theta_0)(\theta - \theta_0) = 0$$

$$\underline{G(\theta_0)} + H(\theta_0)\theta - \underline{H(\theta_0)\theta_0} = 0$$

$$H(\theta_0)\theta = H(\theta_0)\theta_0 - G(\theta_0)$$

$$\cancel{H(\theta_0)}' \cancel{H(\theta_0)} \theta = \cancel{H(\theta_0)}' \cancel{H(\theta_0)} \theta_0 - \cancel{H(\theta_0)}' G(\theta_0)$$

$$\theta = \theta_0 - H(\theta_0)^{-1} G(\theta_0)$$



1. Initial Values
2. Algorithm
3. Convergence Value
4. Max number of iterations