Lab Course Machine Learning

Exercise Sheet 3

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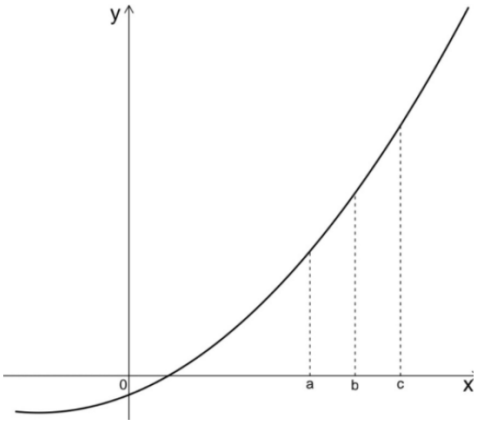
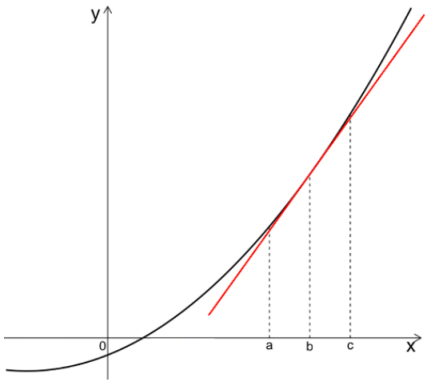
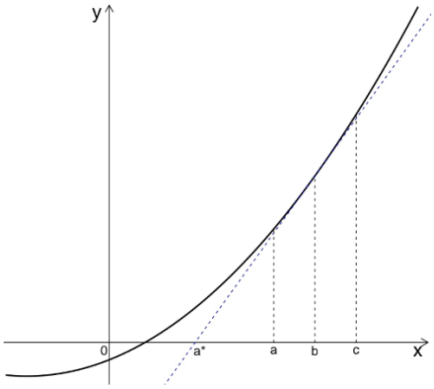
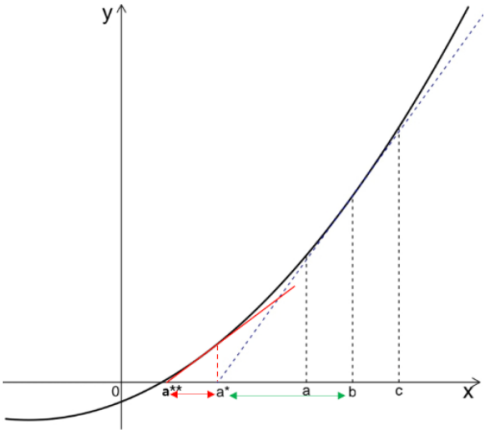
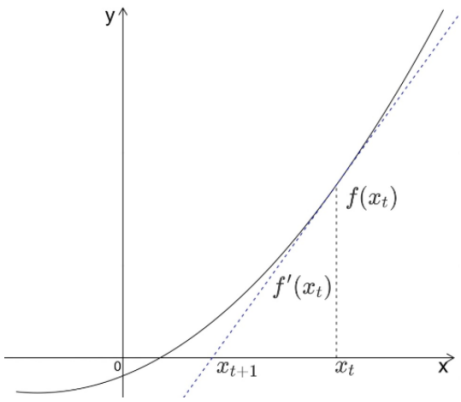
1 Newton's Method

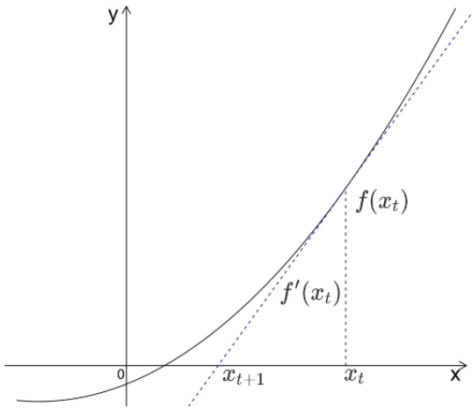




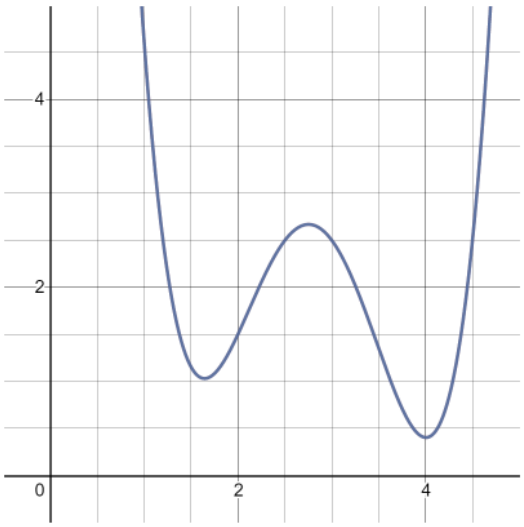




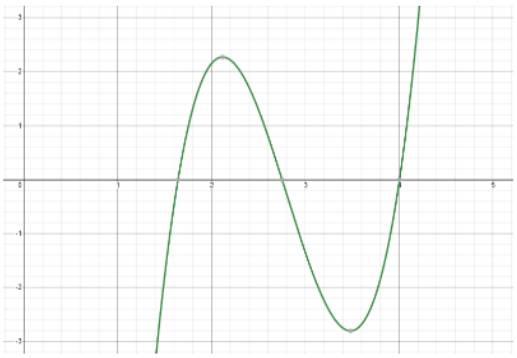




$$f(x) = x^4 - 11.2x^3 + 44.25x^2 - 72.45x + 43. \qquad eq.1$$



$$x_{t+1} \leftarrow x_t - \frac{f'(x_t)}{f''(x_t)}. \qquad eq.2$$



$$\mathbf{x}_{k+1} = \mathbf{x}_k - \mathbf{H}^{-1}\nabla f(\mathbf{x}_k)$$

$$\mathbf{H} = \begin{bmatrix} \frac{\partial^2 f}{\partial x_1^2} & \frac{\partial^2 f}{\partial x_1 \partial x_2} & \cdots & \frac{\partial^2 f}{\partial x_1 \partial x_n} \\ \frac{\partial^2 f}{\partial x_2 \partial x_1} & \frac{\partial^2 f}{\partial x_2^2} & \cdots & \frac{\partial^2 f}{\partial x_2 \partial x_n} \\ \vdots & \vdots & \ddots & \vdots \\ \frac{\partial^2 f}{\partial x_n \partial x_1} & \frac{\partial^2 f}{\partial x_n \partial x_2} & \cdots & \frac{\partial^2 f}{\partial x_n^2} \end{bmatrix}$$