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**(11) Practice Problems**

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(1) Consider the least-squares problem:

$$\min_{x \in \mathbb{R}^m} f(x) \triangleq \|Ax - b\|^2,$$

where  $A \in \mathbb{R}^{n \times m}$ ,  $x \in \mathbb{R}^m$ , and  $b \in \mathbb{R}^n$ .

1. Solve this problem using SAG, SAGA and SG with a fixed stepsize  $\alpha = 10/(16L)$ , where  $L$  is the Lipschitz of the gradient.
2. Plot the norm of the gradient  $\|\nabla f(x)\|$  versus the iteration counter.