Exercise A.

1. (a) $E = \eta \|W\|_F^2 + \sum_{i=1}^{N} \|x_i - W s_i\|^2 + \lambda \|s_i\|_1 \quad \forall_{i=1}^{N} s_i \geq 0$

$$\frac{\partial E}{\partial W} = 2\eta W + \sum_{i=1}^{N} 2(x_i - W s_i)(-s_i) = 0.$$

1. (b) $$\frac{\partial E}{\partial s_i} = 2(x_i - W s_i)(-W) + \lambda \operatorname{sign}(s_i) = 0.$$

$$\operatorname{sign}(s_i) = 1 \quad \text{as} \quad s_i \geq 0.$$

$$\frac{\partial E}{\partial s_i} = 2(x_i - W s_i)(-W) + \lambda \mathbb{1} = 0.$$